PLAYING POLITICS WITH ENVIRONMENTAL PROTECTION: THE POLITICAL ECONOMY OF DESIGNATING PROTECTED AREAS*

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Abstract

Protected areas play an important role in biodiversity conservation, but they also carry local costs in the form of constraints on natural resource extraction. We investigate how policymakers make trade-offs between national environmental benefits and local economic costs by examining the designation of protected areas in the Brazilian Amazon. Using a regression discontinuity design, we find causal evidence that the Brazilian government systematically over-designates protected areas in municipalities controlled by opposition mayors relative to municipalities controlled by mayors in the president's political coalition. In addition, we find evidence that this dynamic is likely driven by the economic interests of local elites in safe districts, and not by those of the municipal electorate. These results show that political considerations bias the geographic distribution of protected areas in the world's largest rainforest.

Keywords: Latin America; Brazil; environmental politics; political alignment; protected areas

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February 12, 2006, was an important day for the Brazilian Amazon. President Lula da Silva from the Workers Party (PT) signed eight executive orders extending existing environmental reserves and introducing a new Sustainable Flora District in the state of Pará. The total area protected was twice that of Belgium. Greenpeace Brazil applauded the decision: "The Lula administration has made today a great contribution to the protection and sustainable use of the Amazon's environmental assets, seriously threatened by road-paving projects and the expansion of soybean agribusiness".[1] But Joselito Soares—mayor of Itaituba and a member of an opposition party, the Social Democracy Party (PSDB)—was indignant, claiming that 300 local timber companies would be shut down.[2]

How do governments decide which areas to protect and why? Protected areas such as national parks or indigenous reservations can curtail deforestation, conserve natural habitats, and support local peoples' livelihoods. But they can also hamper economic activity by limiting land use or discouraging investment opportunities (Naughton-Treves, Holland, and Brandon 2005).

Building on the "fiscal federalism" literature (e.g., Oates 2005), we argue that declaring protected areas entails not only benefits but also costs to elected politicians. We propose that national-local *political alignment* plays a crucial role in the creation of these areas. At the national level, protected areas provide public goods and bring international recognition for environmental conservation. However, a protected area also carries local costs because it restricts natural resource extraction by local firms and politicians. We argue that these costs are concentrated in industries that involve forest clearing and/or the large-scale extraction of natural resources, such as agro-industrial soybean production, cattle ranching, timber, and mining, all of which are significantly constrained in protected areas. Such costs will be highly salient for local economic elites in extractive sectors and politicians relying on the exploitation of the rainforest for political gain.

When allocating protected areas, national politicians will primarily be concerned with max-

[1] "Lula cria mosaico de áreas protegidas na fronteira de expansão do agronegócio." *Greenpeace*, February 12, 2006.
[2] "Prefeitos criticam reservas florestais." *O Liberal*, February 15, 2006.

imizing the diffuse benefits from conservation efforts while limiting costs due to lost economic opportunities (e.g., Fernández Milmanda and Garay 2019). The central government can claim credit for a protected area in any ecologically significant region, and therefore the location of a new protected area is fungible. However, it must also weigh localized costs, and in this calculus it will not consider all localities similarly. All else being equal, we argue that federal authorities will prefer allocating the costs of protected areas to municipalities controlled by opposition parties, and avoid those controlled by political allies in the president's coalition. Hence, we expect newly-designated protected areas to be comparatively smaller where central and local governments are aligned.

We evaluate this hypothesis in Brazil's Legal Amazon for two main reasons. First, the Legal Amazon occupies a large area that is important both for environmental conservation and also agricultural and mineral production. Higher global demand for agricultural commodities in the last two decades has increased investments in primary industries there, raising environmental concerns (Rylands and Brandon 2005). Thus, the Brazilian government has made explicit commitments to conserve the Amazon in both international and domestic arenas since the 1990s (Hochstetler and Viola 2012). Second, Brazilian law grants the president a great share of power for implementing environmental policy (Chiavari et al. 2016). Although federal legislation stipulates a number of prerequisites, the president enjoys substantial discretion when designating protected areas. This leaves room for protecting the environment based on political considerations.

We construct a dataset composed of grid cell-year observations of areas along municipal borders of the Legal Amazon, 1997-2012. To estimate the causal impact of federal-municipal political alignment on the president's decision to protect an area, we use a regression discontinuity design. Administrative boundaries divide neighboring units into treated and control areas in such a way that can be treated as-if random. We restrict our sample to those grid cells that (i) fall within 25 kilometers of a municipal border and (ii) form a pair of treatment and control units—i.e., grid cells whose mayor is aligned to the federal government on one side of the border and unaligned on the

other. This research design allows us to examine the decision of *where* to target protected areas once the federal government has committed to creating new areas.

We find that the probability of the federal government declaring a grid cell as a protected area decreases when the mayor's political party is aligned with the president's political coalition. A president-mayor alignment reduces the incidence of protected areas by 1.0 to 1.2 percentage points. Substantively, these effects are large relative to the sample mean: a difference of 26–32 percent less protection in aligned municipalities on average. These results are robust to cutoffs at different distances, placebo tests, and measurements of geographic location.

We also explore evidence on causal mechanisms, specifically whether effects are driven by incentives to maximize votes (Brollo and Nannicini 2012) or to preserve the interests of local economic elites (Bohlken 2018; Fernández Milmanda and Garay 2019). While protected areas have no discernible effect on vote share, they are correlated with reduced soybean production—one of the Amazon's principal agro-industrial commodities—and leases to extract minerals. Moreover, the targeting of protected areas to avoid political allies occurs principally in municipalities that are core districts for the president and of high economic potential. Combined, this evidence suggests an effort to support economic elites who are invested in extractive activities in safe, co-partisan districts, rather than to generate broader voter support.

Our work makes a number of contributions. First, it builds on federalism literature that investigates the political incentives facing central governments when choosing programs that impact local jurisdictions (Dixit and Londregan 1998). This literature assumes that national-level authorities have objectives shaped by political considerations other than maximizing the local population's welfare. Whereas federal protected areas supply public goods to municipalities, our work shows that these are delivered in ways that do not hinder natural resource extraction by political allies. Our results offer empirical support for the claim that "[w]holly apart from administrative efficiencies and fiscal equalization, centralization affords regimes with political leverage over lower governments and citizens" (Weingast 2009, 289).

Second, we contribute to understanding how political motivations drive governments' decisions to protect the environment in multi-level regimes. Extant studies have focused on bureaucratic competition between national and local agencies (Scheberle 2004) or weakening local regulations to attract investors (Konisky 2007). However, they offer little insight on why a central government decides to favor one jurisdiction over another within the same national regime, potentially overlooking the benefits and costs of environmental policies. Our work joins a growing literature proposing top-down political explanations to uneven environmental protection in multi-tiered polities (see Fernández Milmanda and Garay 2020; Ferraz 2007). We also join new research showing that political favoritism by central politicians to local allies is driven not just by vote-seeking, but also by efforts to benefit local economic elites (Bohlken 2018).

Protected Areas in the Brazilian Amazon

Protected areas in Brazil's Amazon basin went through a large growth period at the end of the last century and the beginning of the current one. Between 1995-2014, both the Ministry of Environment and subnational governments sanctioned 190 new areas across the Legal Amazon's nine states.[3] As of 2014, there were 327 protected areas covering 204 million hectares—40.37 percent of the region. As a result, the Amazon is the country's largest protected biome. Empirical evidence shows that protected areas have helped to reduce deforestation, fire occurrences, and to provide secure tenure to indigenous populations (Nepstad et al. 2006).

Protected areas are created via executive order.[4] The National Protected Areas System sets standards for new areas including technical studies and public consultations (Rylands and Brandon 2005). However, the president enjoys wide discretion to introduce and delimit a protected area in a particular location. Consequently, environmental organizations often complain that "approval or disapproval merely follows political criteria" (Chiavari et al. 2016, 50). For instance, the mayors of Porto de Moz and São Félix do Xingu (PMDB) attacked the decision to create the *Verde para*

[3]Instituto Sociambiental, `https://uc.socioambiental.org/en#pesquisa`.

[4]The full administrative process for designating federal protected areas is described in Appendix Section A1.

Sempre reserve complaining that federal authorities "come here with their cadastral maps ready, invite some religious people, two or three fishermen and farmers, PT supporters, NGOs representatives and hold a meeting... We don't know how it was created and what's going to happen in there."[5] The president can also use legislative powers to veto congressional bills on protected areas or simply delay projects for creating new ones.[6] Though only the congress can reduce existing protected areas, the president has occasionally remapped some of them.[7]

Although the president does enjoy discretion, the president sometimes bargains the designation of protected areas with mayors. According to an important director from the Ministry of Environment, "creating a protected area is a political act in itself... demarcating an area entails intricate negotiations with mayors [and] the president and mayors have to reach an agreement as to the perimeter and shape of the area."[8] Municipalities tend to disapprove protected areas as they are directly exposed to the economic restrictions they impose, thus making consultations between the president and mayors important (ISA 1996). Prior to creating seven protected areas, for example, the Ministry of Environment invited the mayor of Apuí (PROS) and directors of the local agricultural federation to a meeting to discuss their potential impact and seek "a balance between environmental and socioeconomic matters."[9] Similarly, mayors often address the federal government directly to communicate their grievances. The mayor of Novo Progresso (PR) and local ranchers petitioned an audience with the Minister of Environment and the president's secretary to redefine the boundaries of the national park *Jamanxim*.[10]

Another form of federal protected area, but over which the president enjoys less discretion, are

[5]"Prefeitos contrarios a criação das reservas." *Diario do Pará*, February 18, 2005.

[6]A director from the Ministry of Environment stated that"If the president doesn't approve it, then it'll never be implemented... We have a number of those ready to go, we've been working on them for years, but we just don't get the president's signature." Interviewed by Authors, October 5, 2017, Brasília.

[7]President Roussef (PT) issued an executive order in January 2012 reducing areas in Amazonas and Pará to accommodate hydroelectric plants. "Dilma não criou nenhuma nova unidade de conservação na Amazônia," *O Globo*, August 4, 2014.

[8]Interviewed by Authors, October 5, 2017, Brasília.

[9]"Criação de sete UCs no Amazonas é tema de reunião." *ICMBio*, May 15, 2015.

[10]"MMA e ICMBio recebem prefeito e lideranças de Novo Progresso." *ICMBio*, October 3, 2012.

indigenous lands. Indigenous lands are collectively-held titles recognizing indigenous peoples' ancestral territories and which ban all but traditional forms of extraction. Demarcating and monitoring these areas are the responsibilities of the National Indian Foundation (FUNAI), an agency of the Ministry of Justice. Indigenous lands are also approved by executive order.

Unlike with federal protected areas, however, judicial oversight constrains executive discretion when designating new indigenous lands. Two differences are important. First, proposals frequently go through bottom-up channels as formal petitions submitted by indigenous communities. Advocacy groups representing indigenous peoples have successfully litigated to advance these claims, compelling the Ministry of Justice to initiate the creation process.[11] A chief cartographer commented: "The criteria for picking cases could be many…but there are claims that FUNAI must deal with because there's a judge telling us to do so."[12] Second, affected parties can also appeal demarcated areas before presidential approval (Chiavari et al. 2016). This legal resource enables mayors and local businesspersons to block indigenous lands in court, thereby slowing the bureaucratic process and exerting pressure on the president.[13]

A Political Economy of Protected Areas

Protected areas generate winners and losers (e.g., Fernández Milmanda and Garay 2019). On the one hand, they can mitigate climate change, improve national reputation, appease environmental interest groups, and secure forest peoples' livelihoods. For instance, protected areas can be acknowledged as World Heritage Sites, thus garnering reputation as well as legal resources for local communities.[14] They can also put an end to years of mobilization by national and local NGOs

[11] A court ordered the presidency to approve the demarcation plan for Mato Grosso's *Manoki* area. "Justiça dá 30 dias para FUNAI concluir demarcação de Área Indígena em MT," *O Globo*, April 4, 2014.

[12] Interviewed by Authors, October 6, 2017, Brasília.

[13] President da Silva's decision to regularize the *Raposa Serra do Sol* area in Roraima encountered resistance as cattle ranchers challenged the order in a federal court. "Entenda o conflito na terra indígena Raposa Serra do Sol," *O Globo*, May 11, 2008.

[14] "Amazônia Central é declarada patrimônio natural da humanidade." *Agência Brasil*, July 4, 2003.

demanding protections for the rainforest and its fauna.[15] On the other hand, they are costly to the local primary sector because they prevent the extraction of natural resources. The problem is one of public goods provision (Olson 1965; Samuelson 1954): locally costly actions generate broader social benefits at the national, and even global, level.[16]

The "fiscal federalism" theory tackles the problem of local provision of public goods. The literature recognizes the key trade-off as one between the internalization of externalities and local information. The advantage of centralized provision is that the central government does not ignore the public good; the advantage of decentralization is that local policymakers have more information about local costs. This classic approach thus predicts that when local jurisdictions have informational advantages but externalities between jurisdictions are weak, decentralized policy produces better outcomes. Conversely, the absence of local informational advantages and strong externalities—whether positive (public goods) or negative (harm caused)—would favor a centralized approach.

An important gap in the literature concerns the consideration of local costs by central authorities. In our case, Brazil's federal government, led by the president, can allocate locally costly protected areas across municipalities. How does the president decide on where to create protected areas, given the characteristics of different municipalities? We approach this problem from the perspective of cross-level political alignments (Asher and Novosad 2017; Dynes and Huber 2015; Solé-Ollé and Sorribas-Navarro 2008). Specifically, we examine how the president's incentive to create protected areas depends on mayors' partisanship. In this context, the president *is* able to differentiate policies across local areas, using her own information to tailor policies by locality.

We approach this problem with a stylized formal model (Appendix Section A2). A national government decides on the area of land to be protected in a local jurisdiction, which we call a mu-

[15] "Após 17 anos de luta, extrativistas do Rio Jauaperi obtêm vitória com criação de Resex." *Instituto Socioambiental*, June 6, 2018.

[16] Protected areas can also generate local benefits, such as ecotourism and livelihoods. If these benefits are substantial enough, there is no need for the federal government to interfere and local governments can protect the rainforest without federal intervention.

nicipality. Creating protected areas furnishes national-level benefits in the form of environmental public goods and international reputation. Protected areas, however, carry local costs because they constrain the local extraction of natural resources. Ideally, central authorities should efficiently allocate protected areas in municipalities with a "comparative advantage" in conservation—e.g., low potential for extractive activities or strong support for conservation. However, we argue that political favoritism can distort the efficient allocation of protected areas. It reduces the incentives for central authorities to internalize these local costs and benefits by not targeting protected areas to municipalities controlled by allied politicians.

Political alignment crucially determines whether the central government and their coalition of allies internalize these localized costs. We assume that the central government reaps identical benefits from all protected areas, but discounts local costs in municipalities with opposition mayors. The mayor's role in the federal government's calculus depends on the extent to which local voters and interest groups attribute bad economic outcomes to the federal versus the municipal government (see Appendix Section A2). Thus, our main hypothesis is that the central government targets locally costly protected areas to localities controlled by mayors aligned with an opposition party.[17]

We focus on political alignment between the federal government and municipalities due to the critical role municipalities play in Brazilian politics. They are amongst Latin America's most autonomous subnational jurisdictions and enjoy authority over local resources (Samuels 2003). A fragmented federal party system and regional absence for many national-level parties necessitate the building of cross-party coalitions to mobilize political support (Brollo and Nannicini 2012). Presidents provide preferential access to targeted federal programs while mayors act as brokers mobilizing voters. Mayors are also influential intermediaries in government-business relations: local businesspersons donate campaign funds and, in return, mayors deliver pork with federal monies (Boas, Hidalgo, and Richardson 2014).

[17]Empirically, we are unable to distinguish whether governments reward loyal allies or punish opponents by creating protected areas. Both mechanisms would be consistent with our formal model and empirical results.

Finally, we should note that our theory focuses specifically on the decision of *where* to target a protected area once the central government has previously agreed to conserve the rainforest. A key scope condition for our theoretical mechanism to be operable is that the central government has already committed to conserve an ecologically sensitive region, and thus they are exposed to international and/or domestic pressures to designate protected areas. For example, signing international treaties or nominating environmental activists for top cabinet positions. This targeting mechanism can explain the designation of protected areas during the presidencies we study: Cardoso (1997-2002) and da Silva-Rousseff (2003-2012). In that period, important environmental treaties (e.g, the Kyoto Protocol) were ratified and renowned environmentalists (e.g., Marina Silva as the Minister of Environment) were appointed.[18]

Causal Mechanisms

The role of political alignments in Brazil has been empirically demonstrated in past research (Brollo and Nannicini 2012; Niedzwiecki 2016). Most of the literature assumes that federal officials target benefits to aligned municipalities in order to turn out low-income supporters, who are direct beneficiaries of welfare programs. However, Bohlken (2018) recently has found evidence in India that similar cross-level alignments can also target resources to benefit elites under a rent-seeking logic. For federal protected areas, either logic could drive this dynamic. Local costs due to the loss of economic opportunities are potentially borne by two sectors.

On the one hand, protected areas can discourage domestic or foreign investment, primarily affecting local economic elites with ties to extractive industries. When President Cardoso (PSDB) created the *Montanhas do Tumucumaque* park, the mayor of Laranjal do Jarí (PSC) complained about how protected areas "limit the mineral and vegetable potential of the region that is strategic to municipalities' economic development".[19] Our interviews indicate that local economic elites oppose protected areas. A public prosecutor from the Pará state maintained that "...the main op-

[18]Conversely, our argument may not be applicable to recent presidents such as Jair Bolsonaro, who has pledged to withdraw from these protocols and fiercely opposed environmental movements.

[19]"Prefeitos protestam contra Reserva do Tumucumaque." *O Dia*, July 11, 2002.

ponents to environmental regularization are large landowners, who engage in economic exploitation."[20] By discouraging investment, protected areas also hurt the relations between mayors and local firms. Regular access to the rainforest enables mayors to administer rents, granting forest clearings in exchange for revenue, campaign donations, or side-payments (e.g., Pailler 2018). For example, President da Silva's decision to demarcate the *Iquiri* and *Ituxi* reserves in the town of Labrea was worrisome, as more than half of the mayor's campaign funds came from local ranchers.[21] Thus, protected areas could erode the political exchange that takes place between mayors and local primary sectors.

On the other hand, protected areas can also be costly to local communities who depend on small-scale economic activities, such as hunting, fishing, or subsistence farming. For example, the designation of the *Jací-Paraná* area in the town of Burutis nearly led to the eviction of 350 laborers living in informal settlements.[22] These costs would be borne by the broader electorate in the municipality, and therefore the local politician's primary concern would be losing votes, and not maintaining elite access to rents.

We argue that the first set of considerations—maintaining elite access to rents—will dominate over the latter for several reasons. First, concentrated costs on elites will provide better conditions to organize effectively to influence local and federal politicians than broader, more diffuse costs (Olson 1965). Fernández Milmanda and Garay (2019), for instance, have recently shown that local politicians are responsive to the demands of organized agribusiness and prioritize their interests when protecting forestlands. In fact, a director from the Ministry of Environment claimed that "...much of the resistance against protected areas has come from large landowners and extractive firms."[23] Second, losing votes should be less of a concern for local politicians, as blame for diffuse economic costs can always be shifted to the national government, which is the sole au-

[20] Interviewed by Authors, November 29, 2017, Belém.
[21] "Poder de setores que desmatam se reflete nas eleições municipais." *Folha de São Paulo*, December 22, 2008
[22] "Prefeitos criticam reservas florestais." *Diario da Amazônia*, February 12, 2001.
[23] Interviewed by Authors, October 5, 2017, Brasília.

thority charged with designating federal protected areas. Third, costs felt by small-scale activities are potentially avoided through strategies of limited law enforcement (Amengual 2016; Holland 2017; Fernández Milmanda and Garay 2020), or by designating protected areas of sustainable use, which allow for small-scale extraction (Rylands and Brandon 2005). By contrast, forest clearings and large-scale agriculture are harder to conceal and monitored by federal agencies (Gandour and Assunçao 2019). Finally, protected areas entail costly bureaucratic procedures to designate and potential political backlash to reverse. Therefore, the underlying political calculus should consider long-term investments into stable allies rather than short-term vote share gains.

While our main empirical strategy cannot differentiate between these two types of costs, we conduct supplementary tests to explore whether this logic is driven by elite interests or vote-seeking behavior below.

Research Design

We identify the effect of political alignment between national and municipal governments on the designation of federal protected areas in the Brazilian Amazon by using data on the creation of new federal protected areas between 1997-2012. With municipal elections at the end of 1996, 2000, 2004, and 2008, we have a large number of bordering municipalities which present variation in the president-mayor political alignment.

Empirical Strategy

We utilize a regression discontinuity (RD) design. We examine how the area covered by protected areas close to a municipal boundary changes when one side of the boundary is governed by an aligned mayor, but the other side is governed by an opposition mayor. The forcing variable is the geographic proximity to the municipal boundary, across which the treatment assignment (political alignment) will change. The RD analysis allows us to estimate the local average causal effect of variation in treatment assignment close to border regions given a weaker set of assumptions that required for normal regression analysis.

As we focus on areas very close to the border, our approach can be thought of as a "local randomization" design (De la Cuesta and Imai 2016). Assuming all other unobserved variation is smooth across this discontinuity, the assignment of treatment will be near random for those observations very close to the cutoff point. As our forcing variable is geographic in nature, we follow Dell (2010) and use border-segment fixed effects based on municipal pairs rather than including the forcing variable directly in our regression model.[24]

Analysis and interpretation of the RD design is straightforward. Let i denote grid cells, j the municipality-pair boundaries under which they can be grouped, and k states. The index t denotes years (1997-2012). With this notation, we estimate the following model:

$$Y_{ijkt} = \alpha_j + \beta \text{Alignment}_{it} + \varepsilon_j, \tag{1}$$

where β is the coefficient for president-mayor political alignment. All models contain municipality-pair fixed effects α so that only neighboring grid cells on opposite sides of a given boundary are compared. We pool observations over multiple years to gain efficiency in our estimator. Some models also include grid-cell and state-year fixed effects to leverage further gains in precision. Standard errors are conservatively clustered by municipality-pair throughout.[25]

Figure 1 gives a visual representation of our estimation strategy, as applied to the specific example of the *Balata-Tufari* National Forest, designated in 2006 in the Amazonas state. Grid cells are identified according to coalition status with the president's party (red or blue), and the

[24] A more common version includes the forcing variable as an explanatory variable. However, models with one-dimensional measures are inappropriate as they ignore the multi-dimensional nature of geographic discontinuities and also suffer from weak statistical power (Keele and Titiunik 2015). For comparison, we follow Dell (2010) and include distance to the border as well as linear, quadratic, and cubic polynomials based on longitude and latitude as explanatory variables in the Appendix Table A13 and A14, respectively. We do not include higher-order polynomials as they can produce misleading estimates (Gelman and Imbens 2019). Alternatively, Keele and Titiunik (2015) suggest a nonparametric procedure that does not assume the functional form of geographic location. We test the robustness of our results to this approach in Appendix Table A15.

[25] Methodological research on such dyadic designs highlights the difficulties associated with estimating confidence intervals when covariates are monadic (Erikson, Pinto, and Rader 2010). In our case, political alignment is co-determined by partisanship on both sides of the border, and thus we expect the problem of deflated standard errors to be less of a concern.

Balata-Tufari National Forest is identified in light green. The protected area primarily covers the Canutama municipality (headed by an opposition mayor at the time), while largely avoiding the neighboring Tapau and Humait municipalities (both in the president's coalition).

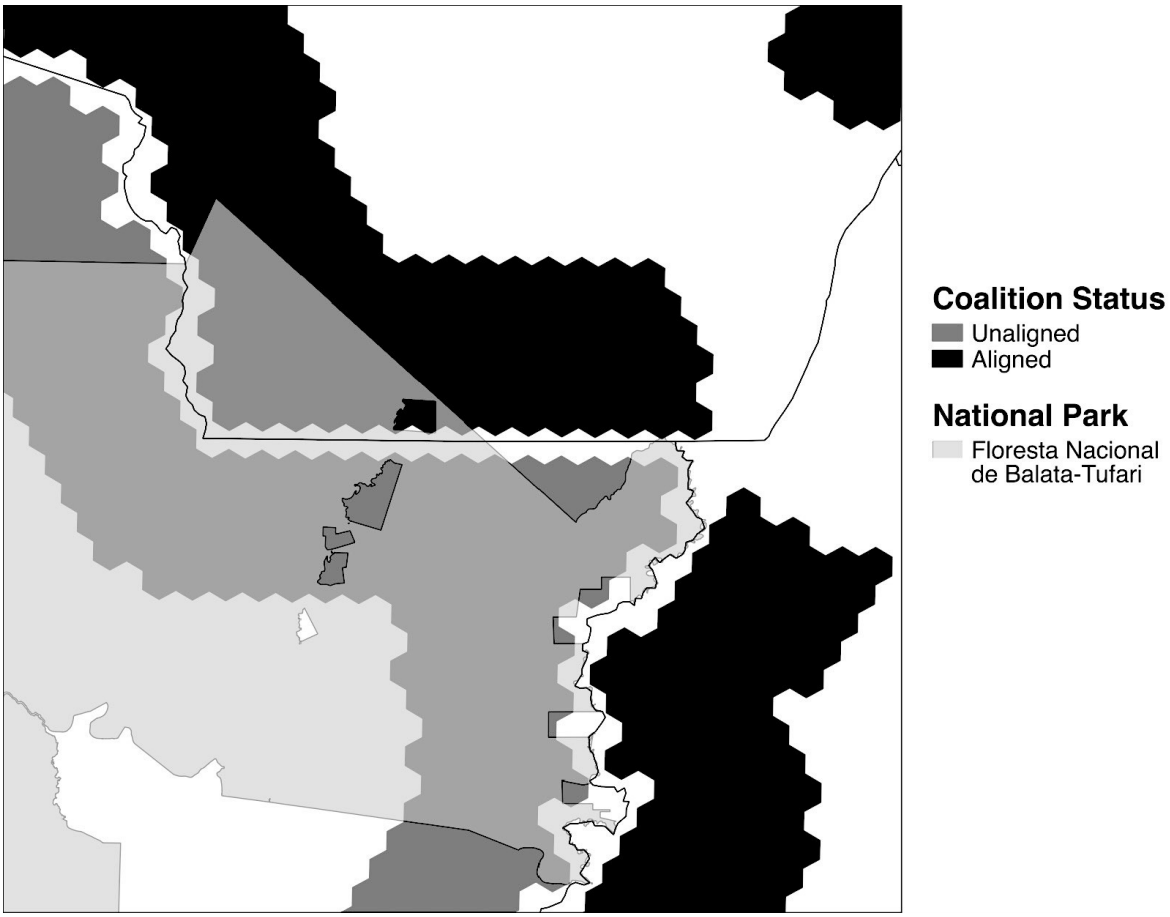

Figure 1: Visual representation of estimation strategy. Sample grid cells overlapping the *Balata-Tufari* National Forest, designated in 2006 in the Amazonas state. Blue cells represent areas in the non-coalition municipality of Cautama, while red cells represent neighboring coalition municipalities of Tapau and Humait. White cells are not part of the sample because they are more than 25 kilometers away from municipal borders or are of the same treatment condition as their neighboring municipalities.

Data and Sample Construction

Our dataset comprises grid cell-year observations proximate to municipal borders within the Amazon.[26] Using grid cells as our level of analysis provides two advantages. First, it facilitates estimation by isolating comparable areas that are within a close distance to a municipal border. Second, we can employ a large number of covariates (e.g., vegetation, rainfall, or agricultural suitability) to test our principal identification assumption: smoothness of covariates over the discontinuity.

To construct the dataset, we overlay a grid of 25 squared-kilometer hexes over the Amazon. Hexes offer advantages over squares as they provide a more realistic unit of analysis and greater precision when sampling variables that span over two dimensions of space. To account for changing municipal boundaries over time, we overlay three different maps from the Brazilian Institute of Geography and Statistics (IBGE) over municipal boundaries (1980, 1991, and 2000). We then account for boundary shifts using municipalities' founding dates and coded grid cells accordingly.

The RD design requires that we examine only areas neighboring municipal boundaries, our geographic discontinuity of interest. Our principal assumption is that all unobserved covariates unrelated to the geographic discontinuity are equivalent on either side of the boundary. We include only grid cells that fall within 25 kilometers of a border.[27]

Next, we subset our sample to include only grid cells along a border segment that separates two municipalities forming a treatment-control pairing for a given year. While this method drops many observations, it is necessary to maintain the requirements of the RD design, which is only valid when border segments that separate neighboring municipalities form treatment-control pairs. Otherwise, if the neighboring municipality were of the same treatment condition (aligned/aligned or unaligned/unaligned) then there would be no discontinuity in treatment assignment around the cutoff of the municipal boundary.[28] Further, models that estimate grid-cell fixed effects effectively

[26]The Legal Amazon includes the following states: Amapá, Amazonas, Arce, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins.

[27]We also test different cutoffs at 20, 15, and 10 kilometers, respectively, in Appendix Table A16.

[28]In a traditional fixed-effects approach, we would include any grid cell that changing in alignment status over

exclude cells that do not show variation in treatment assignment over time. Appendix Section A3 provides further information on sample construction and how grid-cell fixed effects models estimate treatment variation.

Dependent Variable: Protected Areas

Our main dependent variable is the fraction of a grid cell's area covered by a federal protected area. Data on protected areas were obtained from the World Database on Protected Areas, a comprehensive database on protected areas based on information from national authorities and NGOs expert partners (UNEP-WCMC 2015). A map indicating all federal protected areas designated between 1997-2012 appears in Figure 2. In total there are 89 federal protected areas that were approved in the Brazilian Amazon in this period, and of these 71 protected areas (79.8%) are covered by our dataset. The median of a protected area is 2,110.64 squared kilometers—considerably larger than a single grid cell in our dataset but comparable to the size of the median municipality (2,060 squared kilometers). Most protected areas do not cross municipal boundaries or do so only marginally.

Appendix Figure A4 shows the evolution of protected areas over 1997-2012. There is a monotonic increase in the amount of new protected areas declared with a precipitous drop in new areas after 2009.[29] During the entire period, no protected areas were rescinded or reduced in size.[30] Although there seems to be a sharp uptick in new protected areas declared during the presidential elections of 2002 and 2006, there is no noticeable pattern of declarations of protected areas within the electoral cycles.

time. Our identification is based on the RD instead, so we drop all treatment-treatment and control-control municipal boundary pairs. For comparison, we include grid cells from all boundary pairs in Appendix Table A17.

[29]We include indigenous lands and state protected areas in Appendix Figure A4 for comparison and also because we rely on these protected areas as a placebo test below.

[30]A grid cell that is entirely covered by a federal protected area no longer contributes any variation to the outcome, which may attenuate the effect of Coalition Alignment. For comparison, we drop all the subsequent grid cell-year observations of a grid cell once it becomes fully saturated ($Y_{ijkt} = 1.0$) in Appendix Table A18.

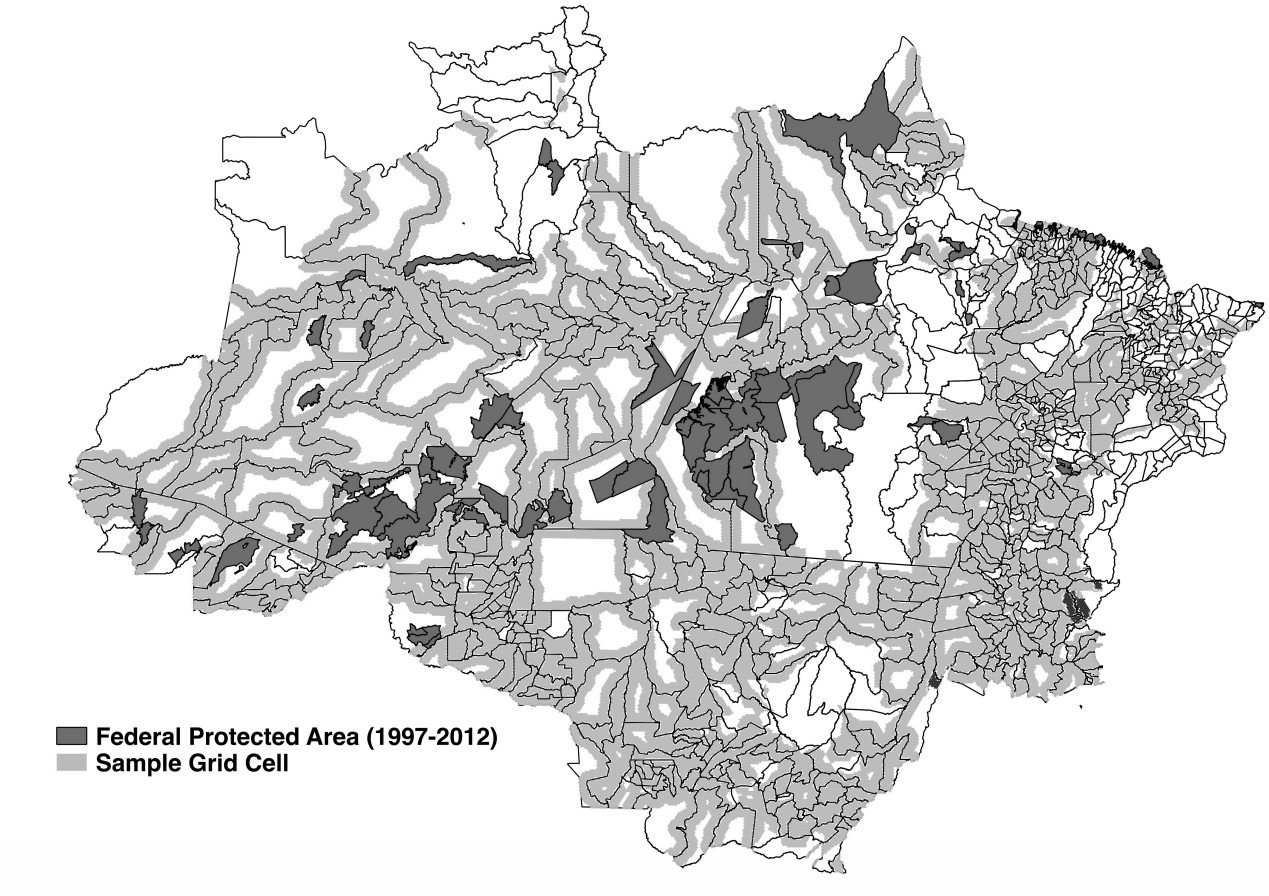

Figure 2: Designated federal protected areas in the Legal Amazon with sample grid cells, 1997-2012

Explanatory Variable: Political Alignment

Our primary explanatory variable is political alignment between the mayor and the president in a given year. We test two measures of political alignment. Our principal measure is Coalition Alignment, a dichotomous indicator for membership of a mayor's party within the president's coalition, defined as any party in the president's cabinet for a given year. Electoral coalitions are important due to the fragmented nature of the Brazilian party system. Although Brazil's two most prominent national parties, the Workers Party (PT) and the Social Democracy Party (PSDB), were in control of the presidency for the entire dataset (1997-2012), both parties formed coalitions to mobilize electoral support. This dynamic influenced federal policymaking and decisions on budget

allocation and transfers (Pereira and Mueller 2002; Brollo and Nannicini 2012).

Our second measure, Party Alignment, indicates direct partisan alignment with the president, either the PSDB (Cardoso, 1994-2002) or the PT (da Silva, 2003-2010; Rousseff, 2011-2016). We draw electoral data from the Superior Electoral Tribunal of Brazil[31] and borrow coalition data from Slough, Urpelainen, and Yang (2017). We plot coalition patterns between the president and mayors over time in Appendix Figure A5 for the included municipalities, distinguishing those that did not change (remained allied to the president or in the opposition) from those that shifted their alignment status (became aligned to the president or went to the opposition) from one election to the other. The data show considerable variation in municipalities that both enter and leave the coalition over time.

Identifying Assumptions

Our research design combines variation across space and over time. The core of the RD design is the comparison of spatially proximate grid cells on either side of a municipal border, ensuring that two grid cells are geographically similar to each other such that differences between them can be attributed to differences created by the municipal boundary.[32]

An essential assumption for any RD design is that all other variation in observable and unobservable covariates should be smooth across the cutoff point—here, the municipal boundary. Our concern is with unobservable variation in factors unrelated to a mayor's political alignment that are predictive of central authorities' decision to declare new protected areas. While the smoothness of unobserved variation over the cutoff point is not directly testable (Lee and Lemieux 2010), a common check is to conduct a balance test for observable covariates. A statistically significant correlation between treatment assignment and a set of covariates would indicate that values of those covariates are not smooth across the discontinuity, and that the fundamental assumption of the RD

[31] `http://www.tse.jus.br/eleicoes/estatisticas/estatisticas`.

[32] In a geographic RD, a common problem is that of compound treatments (Keele and Titiunik 2015). Observations on different sides of a boundary could be different for many reasons so that causal interpretations of the discontinuity would be difficult to sustain. We have over 2,000 municipality pairs and our specifications include pair fixed effects to remove any cross-sectional differences. Thus, the issue of compound treatment is unlikely to arise in our setting.

design has been violated.

We conduct a balance test by running the same model as described in Equation 1, but replacing the dependent variable with one of 39 different pre-treatment covariates that are likely predictive of the designation of new protected areas. The balance tests for the 1996 election are exhibited in Appendix Figure A3. Table A2 offers additional detail on covariates and Table A3 shows similar balance statistics for the 2000, 2004, and 2008 elections.[33] Additionally, we evaluate whether there is spatial autocorrelation between units across the municipal border, which would be a further indication that the two groups are similar in expectation (Keele and Titiunik 2015). In Table A4, we conduct Moran's I tests for each pre-treatment covariate in the same spirit as we did for the balance statistics. As the graph and tables show, very few of the covariates differ across aligned versus unaligned grid cells consistent with the core assumption of the RD.

The geographic discontinuity itself can be strengthened by exploiting variation over time (Cooper, Kim, and Urpelainen 2018). In many of our models, we either include grid-cell fixed effects or control for the fraction covered by protected areas before 1997. These models allow us to compare changes in the *expansion* of protected areas over time as patterns of political alignment change. Next, we test the theoretical assumptions underpinning our research design with two placebo tests. Given that our focus is on the president's regulatory choices, we test whether political alignment shapes the creation of state protected areas and indigenous lands. These two types are not fully controlled by the president, so we would expect political alignment not to have any impact on their creation. Finally, spillovers across borders should not affect our results. Unlike the allocation of polluting activities (Rasmussen 1992; Helland and Whitford 2003), the economic "costs" associated with conservation are limited to areas directly affected by the protected area designation. Therefore, protected areas along a municipal border should have no adverse consequences on extractive industries in the neighboring, non-protected municipality.

[33] For robustness, we include those imbalanced covariates as controls in Table A19.

Findings

We present our main results in Table 1. Models 1-3 test the effect of Coalition Alignment whereas Models 4-6 do so for Party Alignment. Model 1 and 4 control for pre-1997 protected areas. Models 2-3 and 5-6 incorporate grid-cell fixed effects, which account for prior years of protected area designation within a grid cell. Model 3 and 6 include state-year fixed effects to control for state-level time trends.

Table 1: Federal Protected Areas and Political Alignment

	Federal Protected Area			Federal Protected Area		
	(1)	(2)	(3)	(4)	(5)	(6)
Coalition Alignment	-0.010^{*}	-0.011^{*}	-0.012^{*}			
	(0.005)	(0.005)	(0.005)			
Party Alignment				-0.011	-0.007	-0.011
				(0.009)	(0.009)	(0.008)
Fed. Prot. Area ('97)	-0.027^{**}			-0.027^{**}		
	(0.010)			(0.009)		
Muni. Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Grid FE	-	Yes	Yes	-	Yes	Yes
State-Year FE	-	-	Yes	-	-	Yes
Muni. Pairs	2075	2075	2075	1245	1245	1245
Unique Grids	121,141	121,141	121,141	78,265	78,265	78,265
Observations	870,719	870,719	870,719	364,213	364,213	364,213
Adjusted R^2	0.310	0.644	0.683	0.440	0.812	0.850

Note. The unit of analysis is a cell-year. Standard errors clustered by municipality-pair in parentheses.
$^{+}p < 0.1$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

The table offers robust support for the hypothesis that mayors' membership within the president's coalition shields municipalities from protected areas. Models 1-3 show that Coalition Alignment reduces the incidence of protected areas by 1.0 to 1.2 percentage points. The substantive effect is large relative to the sample mean for protected area coverage, which is 3.8 percent of a grid's total area. While results from the RD need to be extrapolated to other territories carefully, they suggest that allied municipalities have anywhere between 26-32% less protected areas than the average for the Amazon. Substantively, a decrease of 1.2 percentage points across the Amazon—a region of 5.5 million square kilometers—would amount to 66,000 square kilometers. By contrast,

the coefficients for Party Alignment in Models 4-6 are in the expected direction but none of them is significant. This null finding casts evidence in favor of our hypothesis: presidential allocative decisions are based on coalition, and not partisan, membership.[34]

Further analysis indicates that the president exerts more influence on the intensive, rather than extensive, margin—i.e., the president is able to reduce the impact of protected areas for political allies, but not avoid declarations altogether. To test this, we pool all grid cells on either side of a municipal border segment and re-estimate the effect of Coalition Alignment on (i) a dichotomous indicator for protected areas (extensive margin) and (ii) the proportion of protected areas (intensive margin). Appendix Table A5 shows null results for the dichotomous outcome, but a negative and significant effect for the continuous measure. Thus, the president likely limits exposure to new protected areas for allies, but cannot avoid it completely.[35]

Evidence on Causal Mechanisms

In this section, we explore evidence on causal mechanisms and incentives behind our main finding. We specifically explore whether the above dynamics are driven by the president's incentive to protect local economic elites' interests in allied districts or to mobilize voters.

First, we test whether the president targets protected areas to mobilize voter support, similar to the logic underlying federal benefit programs (Brollo and Nannicini 2012; Niedzwiecki 2016). Under this logic, a newly-designated protected area should negatively affect the president's vote

[34] Alternatively, opposition mayors may be less likely to cooperate with the president's conservation commitments. Thus, protected areas could be declared to countervail the poor demand of environmental enforcement in opposition districts (e.g., Amengual 2016). We test that explanation in Appendix Table A20 using environmental embargoes—an observable indicator of environmental enforcement—as the dependent variable. We find no significant effect of alignment on embargoes.

[35] We repeat our main analysis on subsets of the sample between the Cardoso (PSDB) and da Silva-Rousseff (PT) presidencies in Appendix Tables A21 and A22, respectively, and find inconclusive evidence that this effect is limited to either administration. The effect becomes insignificant in all but one model specification for the da Silva-Rousseff presidencies. The use of multi-way fixed effects and the limited number of comparable years after subsetting our dataset drastically reduce the within-unit variance over time in our treatment (Mummolo and Peterson 2018; Plümper and Troeger 2007). Nonetheless, given that the effects we have found in Table 1 are for Coalition Alignment, and not Party Alignment specifically, we are confident that our results are driven by our theoretical mechanism, and not by the ideological leanings of the party in office. As municipal ideology is balanced across municipal borders (Appendix Figure A3 and Table A3), we are also confident that our results are not being driven by the ideological preferences of local governments.

share, as the local economic costs would translate into lost votes. However, if placing protected areas is driven by incentives to maintain elite access to rents, there should be no discernible impact.

Table 2 presents OLS results from the impact of protected areas on the incumbent president's vote share. We use municipal-level, panel data on vote share in the first round of presidential elections as the main outcome and the proportion of a municipality covered by federal protected areas as the independent variable. We test three specifications using municipal and state-year fixed effects; all models cluster standard errors at the municipal level. Results show no discernible effect of protected areas on vote share, which is consistent with the elite-driven mechanism.[36]

Table 2: Presidential Vote Share and Federal Protected Areas

	President Party Vote Share			President Party Vote Share		
	(1)	(2)	(3)	(4)	(5)	(6)
Fed. Prot. Area	0.013	0.007	−0.010	0.014	−0.002	−0.015
	(0.016)	(0.015)	(0.008)	(0.025)	(0.021)	(0.012)
Fed. Prot. Area ('97)	−0.019			−0.019		
	(0.014)			(0.014)		
Coalition Alignment				−0.002	−0.009	−0.0004
				(0.009)	(0.012)	(0.005)
Fed. Prot. Area:Alignment				−0.003	0.018	0.008
				(0.032)	(0.030)	(0.015)
Muni. Pair FE	-	-	-			
Muni FE	-	Yes	Yes			
State-Year FE	-	-	Yes			
Observations	6,702	6,702	6,702	6,702	6,702	6,702
Adjusted R^2	0.0003	0.152	0.859	0.0001	0.152	0.859

Note. The unit of analysis is a municipality-year. Standard errors clustered by municipality.
$^{+}p < 0.1$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

We also test whether the president targets core or swing districts when deciding where to place protected areas. This decision follows a similar logic to the distribution of targeted benefits (Cox and McCubbins 1986; Dixit and Londregan 1995), with the important distinction that favored districts will be *less* likely to be targeted for a protected area. The elite-driven mechanism would

[36] Additionally, we run OLS regressions testing whether protected areas affect the vote share of the mayor's party in municipal elections in Appendix Table A23. Results for fixed effects models show no statistically significant effect on the incumbent mayor's vote share, either for coalition or non-coalition parties.

suggest that the president should favor core districts, where political allies have had sufficient time to develop ties with economic elites. Conversely, benefiting swing districts would point to a vote-seeking logic, where the president would be trying to maximize votes in competitive districts.

We replicate our main analysis using a grid-cell level dataset in Appendix Table A6, but include the incumbent president's party vote share in prior elections and interact this variable with our main treatment indicator, Coalition Alignment. Districts where the president received a higher proportion of the vote share correspond to core districts. Figure 3 shows estimated marginal effects of political alignment at different levels of prior vote share for a fully specified model with grid-cell and state-year fixed effects. The negative effect of political alignment on protected areas does not appear until higher levels (over 45 percentage points) of vote share, indicating that core districts are driving this trend.[37] Again, this is consistent with the elite-driven mechanism.

A second set of tests examines potential economic drivers underlying our main results. These tests can demonstrate the existence of local costs and help identify who suffers most from these—elites or the broader electorate. We begin by testing the effect of protected areas on large-scale, resource extraction. If protected areas effectively depress agro-industrial production or mining, then we should observe less extraction in locations with larger areas under environmental protection. We test this mechanism using a difference-in-differences methodology that compares municipal-level changes in soybean production[38] (an agro-industrial commodity) and the number of mining leases[39] in municipalities with different proportions of protected areas. Both variables are measured in logs. We test the impact of a municipality's area under protection, being the total over the pre-1997 period, before and after the start of the 2000s commodities boom, when China became a

[37] We use vote share from the first round of presidential elections, in which multiple candidates are included in the ballot and therefore a 45-percent vote share or higher represents a solid vote favoring the incumbent. However, to check the robustness of these findings, we use a nonlinear model where we interact a series of dummy variables for 10-point vote share bins and find that the highest vote share (municipalities above 70 percent) are driving these results. We include full results in the Appendix Section A6 and also additional robustness checks using margin of victory, which show similar results.

[38] Data come from the IGBE at: `http://www.ipeadata.gov.br/Default.aspx`.

[39] Federal leases allow firms to extract, process, and trade minerals. Data come from the Mining National Agency at: `http://www.anm.gov.br/acesso-a-informacao/dados-abertos`.

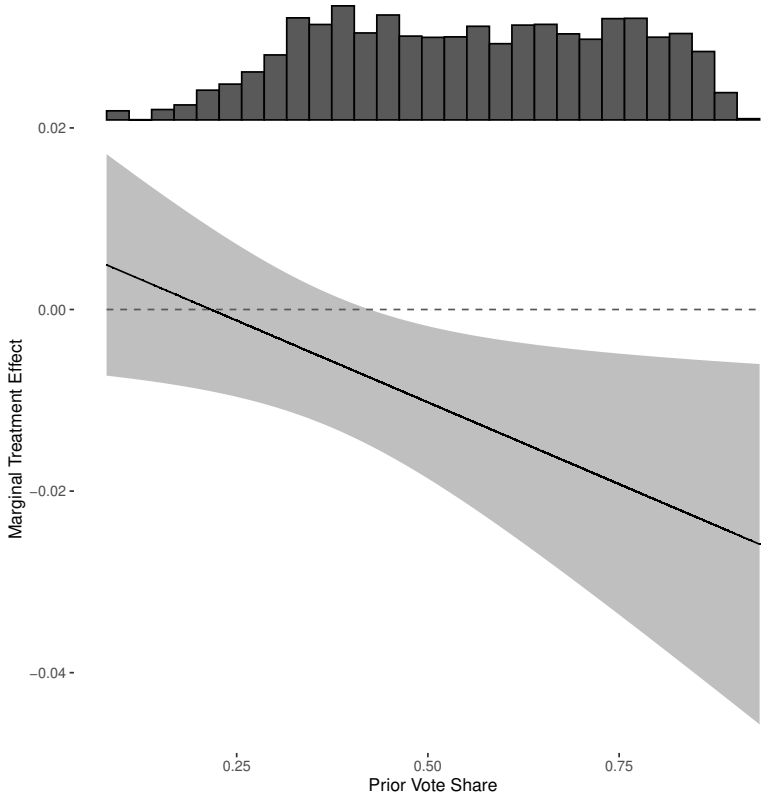

Figure 3: Marginal effect of district-level vote share for the incumbent's president party on the impact of Coalition Alignment. Grey bands represent 95% confidence intervals. The histogram represents the distribution of observations at different levels of prior vote share.

member of the World Trade Organization in 2001, leading to a global hike in commodity prices.

Appendix Table A8 shows that protected areas have a negative and statistically significant effect on soybean production and mining leases in most of our specifications. During the 2000s commodities boom, an increase of 1 standard deviation in pre-1997 protected areas (43% of a municipality's area) decreases the production of soybeans approximately by 4.5–18 percentage points. The same increase in protected areas also reduces mining leases by 1.7–4 percentage points. This is consistent with our elite-driven mechanism. In a time of high demand for agro-industrial and mineral products, when the incentives for natural resource extraction are widespread, protected areas retard local economic exploitation.[40] Figure 4 plots parallel trends in extraction for groups

[40]Protected areas harm elites because both soybean monoculture and mining are capital-intensive activities. Only

of municipalities with and without protected areas before and after the commodities boom.

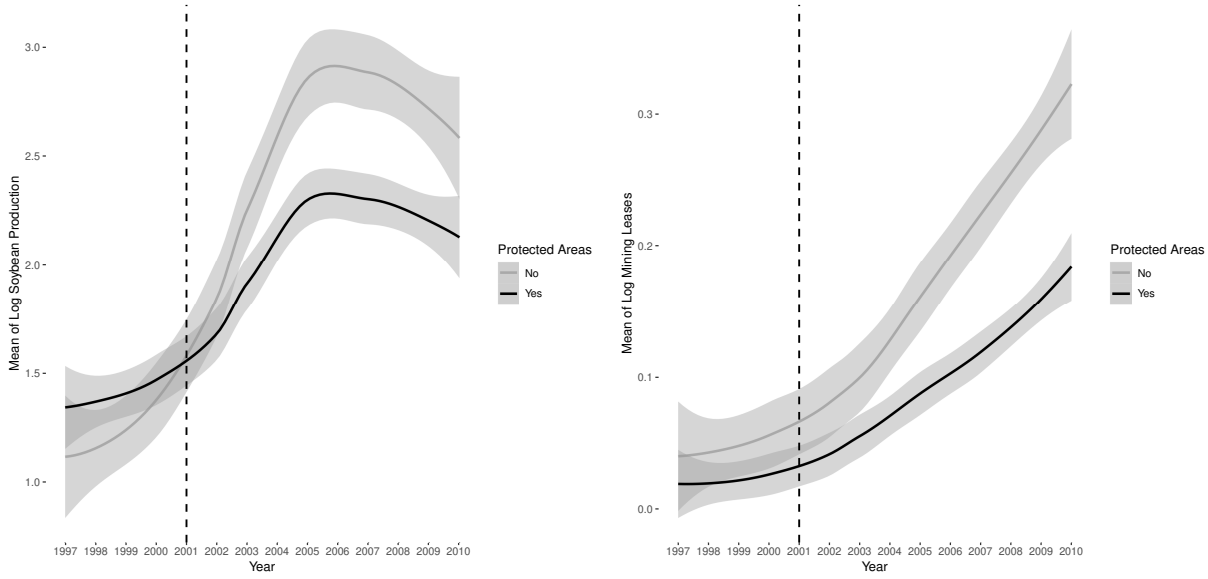

Figure 4: Average annual extraction by municipalities with and without protected areas before and after the commodities boom. Groups with and without protected areas are municipalities with below- and above-median proportions of their areas covered with protected areas prior to 1997.

Second, we test whether areas with higher economic potential bias the targeting of protected areas in favor of political allies. We do so by interacting Model 1 from Table 1 with four different measures of economic potential. The first is the percentage of a grid cell deforested prior to 1997, which captures total potential for exploitation through either timber extraction or agricultural development. The second and third measures use the potential yield for cattle pastures and soybean cultivation, respectively, expressed in kilograms per hectare. These measures are from Food and Agricultural Organization workability database covering the 1961-1990 period.[41] All models use municipal pair fixed effects and control for pre-1997 federal protected areas.

A fourth variable is roadways. Roads have been one of the main drivers of economic expansion

local businesspersons with money, technology, and know-how are capable of producing these commodities at a large scale. By contrast, they should not affect broader rural populations. In Appendix Table A24 and Figure A11, we use measures of peasant agriculture and find that protected areas do not differentially hinder small-scale activities.

[41] Global Agro-Ecological Zones, `http://www.fao.org/nr/gaez/en/`

across the Amazon by providing thoroughfares to extractive industries. We use three alternative measures for proximity to roadways, in kilometers, by drawing on 1993 data from Walker, Reis, and Caldas (2011). First, we evaluate a grid cell's proximity to the Transamazônica highway, Brazil's third longest road and known for facilitating the transportation of timber, cattle, and being a key route to gold deposits (Coelho, Wanderley, and Costa 2017). We then evaluate a grid cell's shortest distance to any of the five principal highways connecting the Amazon with metropolitan areas, including the Transamazônica.[42] Finally, we evaluate a grid cell's shortest distance to any of the forty federal roads that had been constructed by 1993. Nearness to a federal highway should make areas more accessible to exploitation.

We present the results in Appendix Table A9. Results show that prior deforestation has a statistically significant and positive interaction effect with alignment, while the coefficient estimate on Coalition Alignment maintains its direction and significance as well.[43] This indicates that the political incentives for targeting protected areas only operate in grid cells that can potentially be exploited for timber or agricultural use. Appendix Table A10 shows that the Transamazônica highway also modulates the effect of alignment on the designation of protected areas, though with greater variance.

To illustrate this interaction, we plot the marginal effect of prior deforestation and distance to the Transamazônica on the effect of Coalition Alignment in Appendix Figures A8 and A9, respectively. As the proportion of a grid cell deforested approaches 1, the effect of political bias on targeting reduces to zero, which is consistent with the elite interests theory. However, pasture and soybean suitability produce no interaction effects. While economic incentives are likely at play, there is no single particular land use driving political targeting. We see similar effects with proximity to Transamazônica. The marginal effect is statistically significant within a close distance—roughly between 250 and 500 kilometers. As a grid cell gets farther, the effect of Coali-

[42] These are Belém-Brasília, Cuiabá-Porto Velho, Cuiabá-Santarem, and Porto Velho-Manaus.

[43] Results are similar when using the share of municipal deforestation or a dummy indicating that a municipality is a critical area of deforestation (Appendix Table A25).

tion Alignment reduces to zero. We find similar effects for shortest distance to any of the main five federal highways (Figure A10), whereas the interaction effects of federal roads are insignificant.

The above tests show some initial support for the elite-driven mechanism behind political targeting of protected areas. Protected areas show no direct effect on presidential vote share, yet the president prefers targeting them to core districts on average, where ties with local elites are likely well-established. Conversely, protected areas do negatively affect major agricultural and extractive industries, both of which are central economic interests for local elites. In addition, political targeting happens in municipalities where economic potential is high: unexploited areas close to major highways. We are cautious in interpreting these results, however, given that the interaction terms require additional assumptions for causal identification. The economic results may also be consistent with a voter-driven model to the extent that elite and voter interests are perfectly aligned. Nevertheless, these initial results present a compelling explanation for the targeting effect we find and show promise for further development through additional research.

Placebo Test: State Protected Areas and Indigenous Lands

Next, we conduct a placebo test to check if the results change for different types of protected areas over which the federal government enjoys less discretion. Given Brazil's rules for indigenous and state protected areas, political alignment should have no effect on them. The president has little or no influence whatsoever on the creation of state protected areas, and her discretion is severely restricted in the case of indigenous lands. Figure 5 compares the main coefficient estimates for Coalition Alignment based on models for different types of protected areas. Full results are reported in the Appendix Table A11.

These results are consistent with our expectations. While political alignment has a large and negative effect on the creation of federal protected areas, neither indigenous nor state protected areas change because of political alignment. The coefficients for the latter two types are both positive but very small and with wide confidence bounds. Thus, president-mayor coalition alignment has a

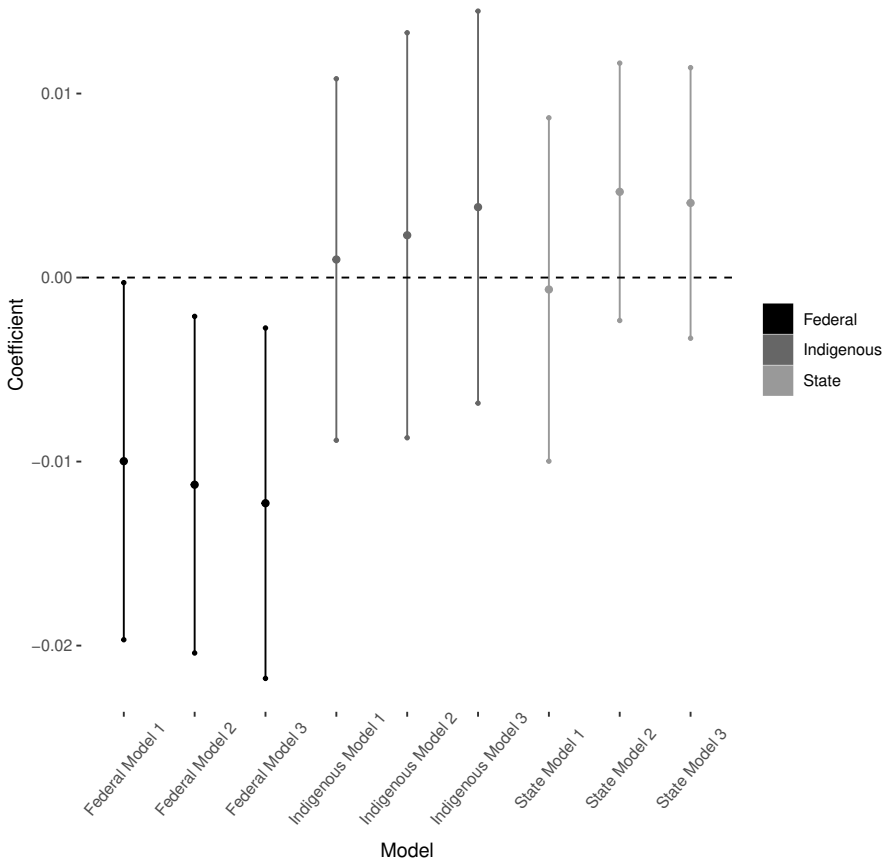

Figure 5: Treatment Effect for Federal, Indigenous, and State Protected Areas

negative effect only on those types of protected areas over which the president has wide discretion.

State-Municipal Alignment

Finally, we test whether our main hypothesis extends to protected areas established at the state level. Like the president, state governors can designate protected areas within state boundaries. However, governor-mayor co-partisanship should have no effect on the creation of state protected areas. First, governors are less motivated to forgo opportunities for extraction because the territory and rainforest they control is scarcer than that of the federal government.[44] Second, state governors

[44]The Brazilian constitution stipulates that the federal government can declare protected areas on any state or federal land, while state governors cannot create units on federal lands or in other states.

are also more isolated from national and international pressures to dedicate new protected regions.

Table A12 shows estimates for the impact of our two measures of political alignment between governors and mayors on the designation of new state protected areas. Results indicate that state protected areas are not affected by any form of state-local alignment—most of the coefficients have the opposite sign and are indistinguishable from zero.[45] Whereas this could indicate that the commitments and sources of pressure to protect the environment that affect presidents are not operable on the state level, it could also reflect the lack of political structures linking state and local politicians in Brazil. Future studies could explore state-local interactions to understand why state-level political targeting does not occur.

Conclusion

The declaration of protected areas to conserve biodiversity offers opportunities to learn about the politics of multi-level governance. Protected areas produce public goods at the global and national levels, but they also constrain economic activities at the local level. When governments grapple with these issues, they must thus balance political and economic considerations across different levels. Here we have found that local politics plays a major role in this process in Brazil: the federal government allocates more protected areas in municipalities with opposition mayors.

Political alignment is a major topic in political science. However, ours is amongst the first attempts to identify the causal effect of political alignment on environmental policy. Drawing inspiration from the literature on fiscal federalism, we find that political incentives can warp the decisions of central governments in setting environmental policy. Political alignments between local and federal governments lead to a politically-motivated allocation of protected areas. Thus, earlier studies (e.g., Oates 2005) may have possibly underestimated the ability of central governments—whether in federal or other polities—to tailor their policies for concrete political gain.

The normative implications, however, are troubling. If political alignment drives the declara-

[45] We test the effect of Coalition Alignment between the president and governors in Appendix Table A26 and find similar null effects.

tion of protected areas, then there is a risk that protected areas are not cost-effective in protecting the environment. Earlier studies in Brazil have already found suggestive evidence for protected areas that appear ineffective (Joppa and Pfaff 2009), and our study offers a potential explanation for this pattern. When the federal government shields politically-aligned mayors from the local costs of protected areas, the distribution of protected areas is skewed. The federal government's pursuit of political gains from favoring co-partisan mayors means that protected areas are not necessarily placed in locations that produce the greatest gains in reduced deforestation, conserved biodiversity, or indigenous livelihoods.

The two negative consequences of politically-motivated designation are (i) conservation of areas that do not warrant it and (ii) the lack of conservation in environmentally important areas. The former could hurt local economies and even mobilize a political backlash against environmental protection. The latter could allow the irreversible destruction of biodiversity where the economic gains fall well below the conservation value. Politicians could even decide to remove previously protected areas, creating the kind of policy uncertainty that hurts the environment and makes economic planning difficult at the municipal level. For example, in November 2018, newly-elected President Jair Bolsonaro promised to dismantle numerous protected areas and indigenous lands across the Amazon rainforest, arguing that they stymie economic development.[46]

Our approach can be applied to other multi-level polities under four conditions. First and foremost, a central government has committed to enact a set of policies. Second, either the benefits or costs of these policies are geographically constrained to the area affected. Third, the discretionary targeting of policies by the central government to lower-tier units is possible. Finally, the central government expects political gains from geographic targeting. One example of further applications is place-based industrial policy, such as the siting of research centers and innovation clusters. Here, a central government committed to redevelopment might target local benefits—jobs, contracts, infrastructure—to certain electoral districts for political gain. Another example might be divisive

[46] "As Brazil's far right leader threatens the Amazon, one tribe pushes back." *New York Times*, November 10, 2018.

facilities, such as hazardous waste repositories. In this case, a central government that signed a joint convention to diminish toxic chemical wastes would avoid siting these facilities in politically important areas. In both cases, the combination of prior commitments, geographically-constrained benefits or costs, discretion for targeting place-based policies, and prospects of political gain suggests that our framework is applicable.

Conversely, our approach might be less helpful for multi-level regimes in which environmental policies are a responsibility of subnational governments; for example, in Argentina, where conservation has been decentralized to provincial governors and the president has less discretion (e.g., Fernández Milmanda and Garay 2020). Moreover, in the absence of commitments to conservation, central authorities may have an incentive to reduce existing protected areas or not enforce them whatsoever in aligned municipalities, thus benefiting allied mayors.

This study is an early effort to understand these dynamics, and we see many future opportunities for political science research on this frontier. Cross-level political alignments are globally important, as almost all countries in the world have multiple levels of government. Brazil is the world's most important host of protected areas, but studying the distribution of protected areas elsewhere in Latin America or in China, India, Russia, and the United States, could offer valuable insights into the external validity of our findings and the modifying effects of political institutions.

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