Greasing the Wheels: The Politics of Environmental Clearances in India*

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Abstract

Does political alignment at different levels of government influence centralized bureaucratic processes? Environmental clearances are important regulatory tools that allow governments to target the distribution of public goods/bads by both controlling negative externalities and allocating rents from project developers. While commentators advocate for central authorities to control environmental licensing of major projects, in emerging markets with weak formal institutions it is still possible for local politicians to influence this process. We use data on environmental clearances in India for thermal (primarily coal-fired) power plants between the years 2004-2014 to test whether local legislators influence an otherwise bureaucratic process in which they play no formal role. Using a regression discontinuity design, we find that partisan alignment with the state chief minister results in a sharp increase in local clearance applications. This is consistent with the hypothesis that this type of political influence"greases the wheels" of bureaucracy by facilitating more environmental approvals, rather than creating regulatory bottlenecks. Our results contribute to a growing literature that suggests that lower-level politicians can still exert influence on the policy process despite having few institutionalized powers.

Keywords: India; coal; environmental regulation; political alignment; political economy

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1 Introduction

To what extent are environmental regulations, and licensing in particular, shaped by political incentives? A robust body of literature on the political economy of environmental regulation offers several suggestions for how political factors can distort the approval process for large infrastructure projects with environmental consequences (e.g., Buchanan and Tullock, 1975; Oye and Maxwell, 1994; DeSombre, 1995). Such research commonly advocates centralizing environmental control in national authorities to limit the influence of local economic interests which may attempt to externalize environmental costs. However, in weak institutional environments such as India, informal networks of power can still exert considerable influence over the policy making process even in areas where procedures are supposedly centralized (see Levitsky and Murillo, 2009). Here we examine the potential for India's Members of Legislative Assemblies (MLA)—local, state-level politicians—to "grease the wheels" of the environmental approval process by acting as brokers between firms and higher-level bureaucrats, despite having no formal role in the approval process. Though our analysis focuses on environmental clearances in particular, the results may extend to other administrative decisions by a centralized bureaucracy that affect the distribution of state resources or public goods.

Environmental clearances, which typically include an environmental impact assessment and a bureaucratic licensing process, play an important role in regulatory politics throughout the world. Their putative rationale is to ensure that major projects, such as power plants, are designed with proper environmental safeguards and do not result in excessive environmental degradation. However, clearances also create opportunities for rent-seeking and political manipulation, as they potentially give authorities the discretion to either fast-track or delay private sector projects for allies or adversaries. This manipulation can either limit entry into a market or cause the overproduction of negative externalities and environmental harms. According to the Statistics Ministry of India, for example, in September 2016 a total of 1,174 infrastructure projects in the country had incurred costs of over USD 20 billion attributed to clearances, permissions, and other factors.[1] Environmentalists, in turn, counter that environmental clearances are not rigorous enough and that corruption

[1] "1,174 Infrastructure Projects Report Cost Overrun of Rs. 1.7 Lakh Crore." *Economic Times*, December 15, 2016.

allows project developers to override environmental safeguards: the Centre for Science and Environment (CSE) argues that "in this haste to give clearances, it is the environment that is being short-changed ... environmental regulations should be strengthened, not weakened."[2]

Here we ask two questions that are particularly relevant for environmental regulation in India. First, does the party affiliation of a local politician matter for the approval of environmental clearances by central authorities? Informal political networks can create distortions in this regulatory process, as politicians trade political favors to target public goods distribution to allies within their party or coalition. In clientelistic and hierarchical political systems such as India's, parties have incentives to target public goods to districts of political importance, and many have noted their use of influence over the regulatory system to do so (Arulampalam et al., 2009; Brollo and Nannicini, 2012; Asher and Novosad, 2017; Lehne, Shapiro, and Eynde, 2018; Bohlken, 2018). There is growing evidence that local and state-level politicians can exert informal influence over national bureaucrats, even where these officials are formally isolated from political pressures (Iyer and Mani, 2012; Asher and Novosad, 2017). Thus, partisan alignment between local politicians and state officials provides a mechanism for how parties coordinate the distribution of goods even for federal policy in which they play no formal role.

Second, does the intervention of local politicians facilitate the approval process for coal-plants, or does it create a barrier of entry limiting the number plants that get approved? Political incentives can produce distortions in otherwise technical, bureaucratic procedures, leading to either an over- or undersupply of government services such as clearances (Shleifer and Vishny, 1993). The effect this has on the number of plants ultimately approved can then have significant implications for the provision of public goods, limiting the access to energy production or causing excessive environmental harms within a locality.

Finding evidence of the effects of political considerations on a complex, bureaucratic process can be difficult, as political influence is rarely a visible phenomenon. Our study offers an innovative empirical strategy by studying the effects of political distortions on a more easily measurable aspect of this process: the demand for environmental clearances. We predict that when politicians or

[2]"The Bogey of Green Clearances." CSE, October 16, 2011.

bureaucrats take advantage of the regulatory process, they produce distortions in the supply of government services such as environmental clearances. Using a regression discontinuity design (RDD) to exploit near-exogenous variation in characteristics of local politicians in India, we test the effects of local legislator alignment with the state chief minister on the market for environmental clearances for thermal power plants between the years 2004-2014.

India's environmental clearance process offers a particularly interesting test case for our approach. First, thermal power plants are a significant component in India's energy and environmental policy framework and plant-siting entails major distributional consequences. Thermal power plants are relatively homogeneous project proposals that are typically large in size. The benefits of thermal power plants include improved power supply and lower electricity prices, whereas costs from environmental degradation range from air pollution, to greenhouse gas emissions, to water resource depletion. Coal-fired energy generation was also the primary source of growth in India's energy sector at the start of the 21st century, as large hydroelectric dams had come online mostly in earlier decades and a major expansion of renewable energy had yet to take hold. Second, the existing political economy literature on India emphasizes the importance of both the role of cross-level political alignment and connections between local legislators and central politicians (Asher and Novosad, 2017; Iyer and Mani, 2012; Bohlken, 2018). Given the evidence on the role of MLAs as important political brokers (Chopra, 1996; Jensenius, 2017) and the influence of state politicians on national bureaucracy (Asher and Novosad, 2017), understanding their role in environmental regulatory decisions is both substantively important and theoretically insightful. The clearance process is also a crucial early step in thermal plant construction, and the environmental consequences are enormous. Of the coal plants in our dataset, 220 (39%) eventually resulted in the proposed plant being constructed for a total estimated capacity of 160 GW.[3]

We find robust evidence for the importance of political alignment to the environmental clearance

[3]This number is consistent with general trends in India's thermal power generation. Between 2003-2016, thermal power generation capacity increased from about 80 to 220 GW. There are a variety of reasons, political and otherwise, that a project that received environmental clearance might not end up being constructed, as these projects typically take several years to be implemented. Some projects, especially the 'ultra mega' thermal plants, encounter fierce local opposition, while in other cases the firm concerned simply loses the necessary financing. Due to the diversity of reasons a proposed plant fails to be constructed, we focus exclusively on clearance applications and grants in this study.

process. We estimate that the probability of thermal project applications increases by roughly two to three percentage points in constituencies that narrowly elect politically aligned candidates—a massive difference given that only 5.6% of electoral constituencies ever receive applications. Although we cannot estimate directly the efficient level of production of environmental clearances in the absence of any political influence, this effect is consistent with the idea that aligned politicians produce an oversupply of clearances, as they exert influence on behalf of project developers. We also confirm that these additional applications are not superfluous, but rather lead to additional approved projects and final clearances. In addition, the pattern of clearances suggests that new applications for thermal projects follow an electoral cycle: the alignment effects are present only in the first few years following a state election. Conversely, we find no effect for political alignment on applications in the last two years of the state election cycle—exactly what we would expect if firms want the clearance process to be completed in a favorable environment and before the threat of political change arrives.

The research design employed here offers a number of attractive features for political science. First, we attempt a novel approach to measuring political manipulation by examining distortions on the demand for new project applications submitted each year. Our focus on the entry of new projects into the regulatory system, combined with a regression discontinuity design, allows us to pinpoint the effect of changes in the supply of corruption and political favors on demand for both efficient and inefficient projects. Though the external validity of regression discontinuity designs is often limited due to sample restrictions, we find that in the Indian context, the eligible sample comprises a large proportion of the total universe of cases, suggesting broader than usual applicability of findings. Likewise, the use of data on clearance applications rather than completed projects allows us to focus more precisely on the political aspects of the regulatory process, avoiding noise added to later outcomes (plant construction) caused by other factors such as market price fluctuations and firm-specific financial issues.

Second, we look outside of the formal institutional structure to understand how local politicians can act as brokers linking federal institutions to local firms, thereby influencing policy despite playing no formal role in a centralized bureaucratic process. This adds to a growing literature that

examines how state politicians in India manipulate national-level bureaucracies that are supposedly institutionally isolated from political influence (Iyer and Mani, 2012; Asher and Novosad, 2017; Jensenius, 2017; Lehne, Shapiro, and Eynde, 2018). Our study also contributes further granularity to the understanding of how formal institutions are often circumvented in weak institutional settings (Levitsky and Murillo, 2009). In addition, our approach offers a distinct contribution to the study of environmental policy from a political economy perspective. Scholars of environmental policy have long recognized that political favoritism and lax enforcement of rules are potential threats to environmental protection (Woods, 2008; Fredriksson and Vollebergh, 2009; Aklin et al., 2014; Oliva, 2015). Studies have not, however, managed to pinpoint exactly how political economy factors compromise environmental regulation. By focusing on actors that have influence outside of the formal institutional structure, we have found that political connections allow politicians to "grease the wheels" and help project developers fast-track environmental clearances, and that developers are cognizant and take advantage of this benefit.

Furthermore, given the massive potential for environmental destruction from coal-fired power plants, our empirical findings should not be interpreted as a socially efficient informal solution to overly cumbersome regulations along the lines of Méon and Weill (2010), who find that corruption can improve efficiency in countries with "extremely ineffective" institutions. Quite to the contrary, political alignment might benefit both efficient projects that supply much needed energy as well as inefficient ones that produce environmental harms that outweigh potential benefits. We argue that our findings are consistent with aligned politicians using their privileged position to help powerful project developers profit from construction and operating contracts. This has significant implications for the capacity of even nominally independent centralized bureaucracies to prevent environmental destruction and threats to human health.

These findings address an issue of critical environmental and economic import and are of significance within India, as the vast majority of thermal power plants there run on coal. According to Guttikunda and Jawahar (2014), in fiscal year 2010-2011 alone, India's 121 gigawatts of coal-fired power generation capacity caused 80-115 thousand premature deaths at an economic cost of USD 3.2-4.6 billion. The policy consequences are relevant at the global level as well, given that coal

is the most carbon-intensive fossil fuel and a major driver of climate change. India is among the countries with the largest capacities of planned, coal-fire generation in the world, second only to China. Therefore, even minor distortions in the clearance process will potentially hinder global efforts to reduce greenhouse gas emissions if all of this new capacity eventually comes online (CGS, 2018)

2 Thermal Power Plants in India: Environmental Clearances

Under Indian law, "any new developmental project activity or expansion of existing projects across a range of sectors" requires an environmental clearance (Chaturvedi et al., 2014: 2). The origins of the clearance system can be found in the 1986 Environment Protection Act, which was later reformed in the National Environmental Policy of 2006. This law dictates that new projects or expansions of existing projects require central approval and publicly-consulted environmental impact assessments. The clearance is thus a part of a broader Indian system of licensing and regulation of entry into the energy market. Other environmentally-relevant clearances that new projects require are the "forest clearance" for projects in forest areas under the Forest (Conservation) Act of 1980 and the "wildlife clearance" for projects in protected areas.[4] Our focus here is on the general environmental clearance, which applies to all major infrastructure projects, including thermal power plants.[5]

Under federal law, any thermal power plant of 500 MW capacity or greater is considered a category 'A' project that requires a full environmental review by the Expert Appraisal Committee (EAC).[6] The environmental clearance approval process consists of three basic steps. First, the project promoter files an application for a terms of reference, which characterizes all relevant environmental concerns that should be addressed through an Environmental Impact Assessment (EIA). Next, the promoter holds public hearings and receives comments which are then incorporated into

[4]These concurrent review procedures are only applicable if the proposed plant requires intervention in forested or protected areas. Only a very small proportion of all thermal projects require these additional approvals (Chaturvedi et al., 2014: 8).

[5]Besides environmental clearances, thermal power plant projects require many other permissions. They are related to taxation, labor law, land acquisition, and fuel supply. Besides the environmental clearance, rules for land acquisition are a potentially important obstacle to development. Notably, however, these two conditions overlap as forest clearances fall both under environmental and land categories.

[6]Smaller thermal power plants can go through the less demanding process as a category 'B' project, and may only require approval by a State Expert Appraisal Committee. Our dataset includes both types of project, as even smaller plants are subject to clearance review.

the EIA report and submitted to the Expert Appraisal Committee. Finally, the EAC releases a recommendation that is then reviewed by the relevant regulatory authority, which has the autonomy to make a final decision of whether to approve or reject a project.

The EAC is an independent, technical body composed of up to 15 experts that must have university degrees and between 10-15 years of relevant experience. Members can serve for up to six years and can only be removed with cause (EIA Notification, Appendix IV). Despite its functional independence, the EAC is limited to making "recommendations" regarding the projects it reviews—the underlying regulating authority (in the case of thermal plants is the Central Electricity Regulation Commission) ultimately has the power to accept or reject the project and may freely contradict the EAC's recommendation (EIA Notification, art. (8)(i)). However, the EAC does have the power to request clarifications and additional information at the end of the approval process (art. 7(IV)(i)).

In practice, this ability to request clarifications is the EAC's most powerful mechanism for blocking projects. According to an assessment conducted by Chaturvedi et al. (2014), "90% of the projects in construction, hydropower and industry sectors have been approved within a year of the application" (60). However, a detailed analysis of 120 recent reports revealed that for those projects that had delays greater than 940 days in approval, "submission of inadequate or incomplete information in the application submitted by the project proponent was found to be the major cause of delay in granting environmental clearances" (17). Thus, delay, rather than outright rejection (which can easily be ignored by regulating authorities), may be the most effective way for an EAC to block a potentially inadequate project. According to Chaturvedi et al. (2014), "[t]he time taken for required document submission is huge across sectors, from 440 median days for infrastructure sector to over 1000 median days across hydropower, coal mining, thermal power and nuclear power projects" (10).

Figure 1 shows the distribution of requested environmental clearances for thermal power plants within India. The requests are aggregated at the electoral constituency level, following the pre-2007 delimitation boundaries. As the map shows, most states have a significant number of requests. The state of Chhattisgarh has a particularly dense concentration of requests. This is likely due

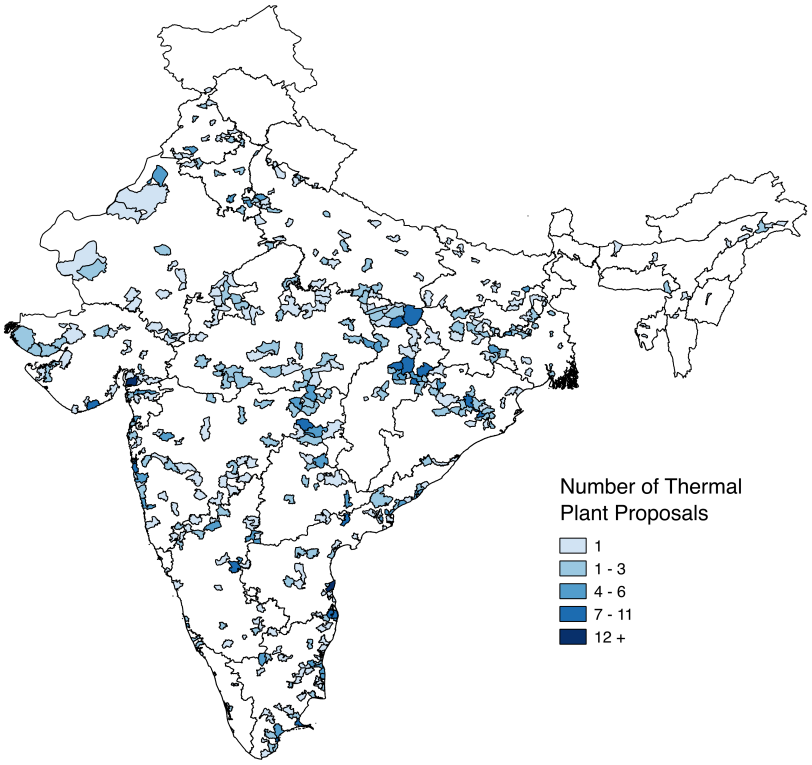

Figure 1: The distribution of environmental clearance applications for thermal power plants in India. Applications are aggregated at the electoral constituency level, following the pre-2007 delimitation boundaries. The data source is the online portal of the Ministry of Environment and Forests.

to existing energy policy in India, which encourages locating coal-fired power plants close to the country's coal mines; many of these mines are found in Chhattisgarh.

In our data, 39% of applications convert into actual power plants over time. This percentage reflects the reality that coal-fired power plants are, especially today, inherently risky propositions (CGS, 2018; Yang and Urpelainen, 2019). An environmental clearance does not end local protests, and the competitiveness of renewable energy continues to improve over time. Financing could also become a problem, as interest rates fluctuate and insurance companies are increasingly turning away from coal. So while an environmental clearance is necessary for construction, it is by no means sufficient.

3 The Politics of Environmental Regulation

Theories of environmental regulation emphasize both the social value of mitigating negative externalities and the use of regulatory constraints in rent-seeking. As noted above, the rationale for regulating environmental pollution and natural resource depletion is that economic agents fail to internalize the negative externalities—harm to others—from their activities (Cropper and Oates, 1992). However, another strand of the literature approaches the problem from a very different perspective, focusing on the *distributional* consequences of regulation. Drawing inspiration from the positive political economy of regulations as barriers to entry (Stigler, 1971), this literature notes that environmental regulation can be used to produce rents for certain producers at the expense of other producers and consumers (Buchanan and Tullock, 1975; Oye and Maxwell, 1994; DeSombre, 1995). Regulation allows authorities to allocate permits—a scarce resource—according to their own preferences, including for reasons of partisan bias or personal profit.

These perspectives can be applied to the case of environmental clearances for thermal power plants by noting that the regulator controls entry to the power generation market through the allocation of permits. The social purpose of the environmental clearance process is to ensure that new power plants comply with environmental legislation and have safeguards against environmental harm. However, environmental clearances, like other regulatory processes, can also be used to restrict entry to a market, thereby enabling politicians to extract rents from project developers or grant political favors.

Developing this perspective, we investigate the potential for "political manipulation" to distort the regulatory process of environmental clearances. By political manipulation, we refer to the potential for decision-makers to consider interests other than those directly related to the costs and benefits (e.g. economic growth, energy supplied, environmental externalities, etc.) when evaluating a new project. Specifically, we look at the impact of political patronage between politicians at different levels of government. This form of manipulation places incentives for supporting allies in a political coalition (typically from the same political party) over considerations of the public good—be it the provision of energy or the prevention of negative externalities.

Our focus here is on the capability of legislators to control the environmental clearance process,

not on their motivations for doing so. Examining the electoral implications of environmental approvals or subsequent construction of thermal plants is outside the scope of this paper. With that in mind, we acknowledge that these projects may have important electoral benefits and that the incentives of MLAs to promote them may be related to these considerations. In particular, politicians use targeted access to services to build or maintain political support in important districts by providing them with the jobs and contracts that may accompany a thermal power plant. Such "White Elephant" projects could also be a way for politicians to credibly signal a commitment for future transfers to a district or constituency group by committing to inefficient projects with highly specific assets (Dixit and Londregan, 1995; Robinson and Torvik, 2005).

3.1 Local Legislators as Political Brokers

We focus our examination on the role of state legislators. In India, legislators—in this case, Members of State Legislative Assemblies (MLAs)—do not play a *formal* role in the regulatory process. Their ability to influence environmental regulation is thus indirect and informal. Drawing on studies that identify state legislators as "fixers" who use their connections to help their constituents (Chopra, 1996; Jensenius, 2015; Asher and Novosad, 2017; Lehne, Shapiro, and Eynde, 2018; Bohlken, 2018), we assess the role of these lower-level politicians as influential individuals who might have a self-interest in promoting local economic development, whether for electoral (votes and interest group support) or rent-seeking (bribery) reasons. From this perspective, MLAs are important because they hold political power and provide important constituency services, which can include "delivering 'pork,' attending weddings and funerals, negotiating to solve individual problems, and dealing with requests for help in contacting various state officials" (Jensenius, 2017: 65). Thus, when a project developer with potential electoral or personal influence seeks assistance from a local politician, the MLA can use his or her political power to help the project developer secure an environmental clearance. The project developer, in turn, mobilizes voters and/or offers financial support to the MLA's electoral campaign.[7]

MLAs spend the majority of their time offering constituency services and acting as fixers for

[7]Our emphasis on the MLA is not to say other players are irrelevant. Political economy analysis of regulators, cabinet ministers, interest groups, and the public all promise important insights into the political economy of regulation in India.

local activities. Chopra (1996) in his seminal work on MLAs reports that only 3% of the MLAs he interviewed spend most of their time on actual legislative activities, the rest dedicating their efforts to constituency services. To illustrate the MLA as a fixer, Jensenius (2015: 58) describes the life of a senior MLA from India's largest state, Uttar Pradesh. Although the MLA lives in the state capital, Lucknow, he visits his constituency once a week to listen to people's requests. While some of the requests are individual issues, such as police harassment, at least half relate to development projects such as road construction. After listening to the requests, the MLA helps his constituents by making phone calls to relevant cabinet ministers and other influential authorities, explaining the needs and wishes of the constituents. From the MLA's perspective, influencing ministers and other authorities is easy for someone with good relations and powerful connections.

MLAs are particularly helpful to developers of large infrastructure projects by providing key contacts and information at the local or village level. If a project developer is interested in securing an environmental clearance in the MLA's constituency, the MLA can serve as a broker who builds local public support, provides the project developer with essential local information, and can navigate complex negotiations for land acquisition. MLAs provide such services through networks of local political leaders who provide direct brokerage between village and block residents and state institutions, often in exchange for patronage, contracts, or distribution of state resources (Pattenden, 2011; Witsoe, 2012). This network is particularly important for acquiring land for the project, which requires "tremendous informational demands about the complexities of 'local' lifeâĂŤpower relations, kin ties, caste connections, and family dynamics," all of which can be difficult for a large corporation to obtain (Gupta, 2017: 1870).

In addition, there is specific evidence that MLAs frequently participate directly in the public hearing process required for all thermal projects. Commentators have noted their participation during these processes tends to be quite influential and can leverage local political support for a project (Patra and Satpathy, 2014: 83). MLAs have also participated directly in public hearings to downplay the concerns of opposition to projects by environmental groups.[8] Bohlken (2018) has

[8]E.g. Anparthi, Anjaya. " MLA Parwe, others obstruct anti-plant activists.âĂŹâĂŹ *The Times of India.* (July 5, 2012); Behl, Manka. "Ecology, economy and environment to take a big hit.âĂŹâĂŹ *The Times of India.* (March 3, 2019).

also found evidence that MLAs play an important role in promoting local development projects (e.g. local infrastructure, roads, etc.) for higher-level politicians. Specifically, Bohlken shows that national-level legislators (Members of Parliament) are more likely to successfully implement a development project using discretionary funds when politically aligned with local MLAs.

In addition legislators may use their position to gain access to information that helps project developers.[9] As Chaturvedi et al. (2014) notes, the lack of information on the part of the project developers is an important source of delay for environmental clearances. If the MLA can help project developers access information on local conditions, this source of delay can be minimized. The MLA can, for example, request that central, state, and local officials share relevant data with project developers that would otherwise require significant time and resources to collect; he or she can also clarify the interpretation of legal rules and regulations in the books.

Similarly, although state-level politicians have no formal role in the environmental clearance process, which is controlled by national-level bureaucrats, there is growing evidence that state governments and Chief Ministers have considerable influence over central bureaucrats. Project promotors frequently sign non-binding, memorandum of understanding with state governments before applying for central permits in order to secure assistance with "acquiring land, meeting water requirements, conducting the public hearing mandated under the Environmental Protection Act, facilitating clearances from state and local bodies and pushing the case of the company with the central authorities for coal linkages and other central clearances" (Kasturi, 2011). Iyer and Mani (2012) show that state Chief Ministers, though lacking power to directly appoint or remove bureaucrats, can exert control over agents in the Indian Administrative Service by using powers of horizontal transfers. Asher and Novosad (2017) find that this power can result in actual influence over the policy process. Specifically, they show how alignment of MLAs with central authorities affects the approval of mining permits through the central Bureau of Mines, even though state ministers have no formal role in the process. As the former Environment Minister Jairam Ramesh lamented about the influence of the state government in environmental regulation: "In the state,

[9]Project developers can be both public and private entities. Besides NTPC (National Thermal Power Corporation), other major public developers include the power generation firms of large states, such as Maharashtra and Tamil Nadu.

the chief minister is the king, he's the sultan."[10] Given this potential for informal influence, political connections with the Chief Minister of the state can give local MLAs an important inside path to affecting the bureaucratic approval process for coal plants.

The case of Adani Power, one of India's largest power plant developers, illustrates this dynamic (Dasgupta and Law, 2020). In early 2017, Adani Power was in the process of applying for an environmental clearance for a new coal-fired power plant in Godda district, Jharkhand. The local population, which was largely tribal, was vehemently opposed to the plant because of concerns about displacement and forest degradation. A local hearing was scheduled in March 2017, but the local population complained that a large contingent of police refused to let concerned villagers into the meeting. A local MLA, Pradeep Yadav, from the Jharkhand Vikas Morcha party, arrived to the meeting to insist that people be allowed to join the meeting. MLA Yadav, whose party was allied with the Indian National Congress, a national-level opposition party, used his political clout to enable the local population to raise their concerns. He had also earlier requested that the meeting the postponed due to inadequate notice time, and was later arrested in April 2017 for organizing a protest against Adani Power (Jha, 2017). It is impossible to tell whether his tactics contributed to delay, but Adain Power ultimately won the environmental clearance in August 2017.

3.2 Legislator's Position: Partisan Alignment

We examine the possibility for local political connections influence the environmental clearance process. Political alignment between central and local politicians plays a central role in decision-making regarding the distribution of public goods and targeted benefits in many political systems marked by clientelistic structures (e.g., Magaloni, Diaz-Cayeros, and Estévez, 2007; Brollo and Nannicini, 2012; Golden and Min, 2013; Allen, 2015). Higher-level authorities count on local politicians to mobilize voters and provide a political base of support, while in turn these local brokers depend on central state and federal politicians to target much needed resources to their constituencies. In the case of India, political alignment has been shown to affect the allocation of infrastructure projects (Bohlken, 2018), the assignment of central bureaucrats (Asher and Novosad, 2017), and

[10]Cited in: Barry, Elen & Bagri, Neha Thirani. "Narendra Modi, Favoring Growth in India, Pares Back Environmental Rules." *The New York Times*. (Dec. 4, 2014). https://www.nytimes.com/2014/12/05/world/indian-leader-favoring-growth-sweeps-away-environmental-rules.html

local economic outcomes (Iyer and Mani, 2012). Due to the importance of multi-level alignment in India politics, we focus on alignment as a potential mechanism for how local politicians can influence central bureaucratic processes.

Specifically, we test the effect of political alignment of local legislators with the state Chief Minister's party on the demand for environmental clearances. To do so, we begin from the perspective that political distortions on the market for government services—in this case, environmental clearances—can either lead to the under- or over-production of those services (Shleifer and Vishny, 1993). Project developers will then either respond to these distortions by adjusting their behavior, either increasing demand for new clearances in the case of a new potential for over-supply, or decreasing demand in the case of an under-supply.

In conducting the analysis, we consider both public and private benefits/costs. Public benefits and costs may play a role because the MLA faces electoral competition. Benefits include employment opportunities and increased economic activity from contracts These can be large during the construction period. Costs include air pollution, water pollution, water consumption, and land use. Of these costs, air pollution may harm a large group of people outside the constituency as emissions are dispersed.

In the Indian political system, private benefits play a key role due to widespread corruption (Vaishnav, 2017). For an MLA, a power plant is a major opportunity for bribes and political support. If the MLA manages to secure a clearance, he or she may expect the project developer to pay a bribe and/or support a future election campaign. Much of our theory building focuses on this insight, as political alignment provides a rent-seeking opportunity for the MLA. In contrast, we do not expect power plant projects to carry notable private costs. On balance, then, we expect private rent-seeking to be the primary factor in the MLA's consideration to support power plant applications.

There are limits to the flexibility of firms to respond to political changes: these are large projects with significant profit potential, and firms may be unwilling or unable to call off a proposal simply because the political atmosphere is not right. However, there are some avenues of flexibility. In particular, although a coal plant is likely to be somewhat fixed with respect to location (a

firm is unlikely to relocate a proposal to another state), it may be possible to change the precise coordinates of a structure from one local district to another nearby.[11] In addition, although a firm may be reluctant to wait a full five years to initiate a process, they may be willing to put plans on hold for a few years if an election is imminent.

We therefore argue that electoral outcomes may influence both the location (with respect to legislative constituency) and timing of thermal project proposals: if a favorable political environment is sufficiently desirable, firms will be willing to modify their plans in order to pursue an opportunity that presents itself.[12]

The specific direction of this impact will depend on how specifically political influence affects the provision of centralized clearances. We test for two possible distortions. First, co-partisanship between politicians at differing levels of government may reduce the costs required to obtain a clearance, effectively "greasing the wheels" of bureaucracy. The discussion in the section above suggests that MLAs are active participants in the clearance process (Patra and Satpathy, 2014). When an MLA in politically aligned with the Chief Minister from their state, with the accompanying influence over the bureaucracy the Chief Minister enjoys, they may be more effective in this regard. These linkages may help to streamline the process of applying for a clearance and lower the overall costs (in time and effort) required to obtain one.

This should, in turn, increase the demand for new environmental approvals among project developers. As clearance become easier to obtain and less costly, demand should correspondingly increase. Under these conditions, firms will interpret political alignment of MLAs as a strong signal that the cost of environmental clearances are decreasing. Many researchers have noted the strong clientelistic structure of India's political system (Weiner, 1967; Chandra, 2007; Ziegfeld, 2016) and that political alignment has important effects on the local economy (Asher and Novosad, 2017) and public service delivery (Arulampalam et al., 2009). When presented with an alignment between local and higher level government (including both state and central leadership), promoters

[11] Only around 11% of the thermal project proposals in our dataset are explicitly expansions or replacements of pre-existing projects as indicated in a brief project description.

[12] Given that India has over four thousand electoral constituencies at the state level, no particular constituency is uniquely suited for a coal-fired power plant in terms of transmission infrastructure, access to coal, land availability, and water resources.

in that district will more likely present projects due to a higher expected likelihood of a smooth and favorable approval process. This leads to our first hypothesis:

Hypothesis 1. *If MLAs use political connections to reduce the cost of environmental clearances, when a candidate aligned with the state government wins an election, applications for environmental clearance increase in his/her constituency.*

Above, we used Adani Power's plans in Godda district, Jharkhand, as an illustration. In that case, an opposition MLA attempted to stall the environmental clearance. In a counterfactual scenario, an MLA from Jharkhand Chief Minister's Bharatiya Janata Party might have instead worked with Adani Power to secure the environmental clearance, perhaps in exchange for a kickback and some local contracts and jobs. The predicted outcome from this counterfactual is consistent with the hypothesis that politically aligned MLAs can facilitate environmental clearances. Without alignment, opposition MLAs either fail to grease the wheels or, in the case of the Adani Godda environmental clearance, actively work to stall the regulatory process.

In the second case, political distortions could increase costs and barriers to environmental clearances. This would be the case suggested by authors cited earlier that regulatory bottlenecks can be used to extort project developers for additional rents (Buchanan and Tullock, 1975; Oye and Maxwell, 1994; DeSombre, 1995). In this case, MLAs do not use their political connections with the Chief Minister to facilitate projects, but rather to limit projects for personal profit at firms' expense.[13] Under these conditions, the cost of environmental clearances will increase, and therefore the demand for clearances should be depressed:

Hypothesis 2. *If MLAs use political connections to obstruct new projects, when a candidate aligned with the state government wins an election, applications for environmental clearance decrease in his/her constituency.*

As we test these hypotheses, we also consider and rule out alternative explanations. Our regression discontinuity design is well-suited to excluding the possibility of a selection effect, with

[13] While MLAs themselves do not have direct control over access to environmental clearances, state Chief Ministers potentially exercise a powerful sanctioning mechanism over central bureaucrats (Iyer and Mani, 2012) that can act as a de-facto control over the provision of services.

certain constituencies specifically selecting pro-developer MLAs who then secure projects. If a constituency has a large business community, it may favor MLAs who promote new infrastructure development. Because our design is based on a quasi-random selection of MLAs, it effectively rules out such selection effects.

However, our research design cannot fully distinguish between two variants of our argument. In one, aligned MLAs actively promote projects. In the other, non-aligned MLAs act to block projects. These are observationally equivalent and distinguishing between them would likely require a quality, case-based approach.

4 Research Design

We assess the causal effect of political alignment of local MLAs on the demand for environmental clearances for new thermal plants in India. Our unit of analysis is a constituency-election period within state legislatures. For example, given that Bihar had consecutive elections in 2005 and 2010, in our dataset, Bettiah, a constituency in the Bihar assembly, appears as two observations (Bettiah 2005-2009 and Bettiah 2010-2014). Elections in Indian state legislatures are held every five years, hence each data point represents a five-year period. Table 1 summarizes the data we use for the analysis.

Let i denote a constituency, j a state, and t a (5-year) election period. In this setup, our basic estimation equation can be written as follows:

$$Y_{ijt} = \alpha_t + \gamma_{jt} + \beta_1 \mathrm{T}_{ijt} + \beta_2 \mathrm{MoV}_{ijt} + \beta_3 \mathrm{T} \times \mathrm{MoV}_{ijt} + \epsilon_{ijt}, \tag{1}$$

where T denotes either an aligned candidate's victory in a close election and MoV indicates the vote margin for that candidate relative to his or her strongest competitor (this is a sharp RD design with a cutoff at a vote margin of 0 percentage points). We estimate this equation with and without election year fixed effects α_t and, in some specifications, state-period fixed effects γ_j, so that election outcomes are only compared within state elections.

	Full Dataset		Aligned Politicians	
	Full	.05 Margin	Full	.05 Margin
Observations	6137	2049	2667	778
Constituency Level				
States	23	23	23	22
Constituencies	3507	1747	2141	737
Proposal Dummy	0.06	0.05	0.06	0.06
No. Plant Proposals	0.09	0.09	0.11	0.12
Turnout	69.1	69.03	68.39	68.79
Individual Level				
No. Candidates	5572	1986	2516	766
Female	0.08	0.08	0.09	0.1

Table 1: Summary statistics for the total RDD sample and disaggregated for the sample of politically aligned politicians. Statistics are given for the full sample and the restricted sample around the cutoff point of +/- 0.05 vote share margin.

4.1 Dependent Variables: Applications and Approvals

The primary dependent variable of interest is an indicator (0/1) for any thermal power plant application submitted within a constituency-election period.[14] We obtained official data for all environmental clearance applications from the website of the Ministry of Environment, Forest and Climate Change of India.[15] The thermal designation includes power plants that run on a variety of fuel sources, including coal, natural gas, biomass, diesel, and other types. However, in the Indian context, a substantial majority of plants (74% of our dataset) are fueled by coal.[16]

We use data on applications submitted prior to July 2014, after which there is a change in the regulatory process which would make comparisons with earlier applications difficult. Here we must acknowledge that this cutoff coincides with the election of Prime Minister Narendra Modi in May 2014, which brought to power a unified, majoritarian government led by the Bharatiya Janata Party (BJP). Our analysis, instead, coincides with the United Progressive Alliance's (UPA) rule

[14]Note that some units received more than one application. The results in the next section are largely unchanged regardless of whether we use an indicator for the number of applications received in a period or the dummy indicator for any application as described here.

[15]See `http://environmentclearance.nic.in/`.

[16]The next most common fuel type is natural gas, comprising 15% of the clearance applications in our data, with other sources making up the remaining 12%. We undertake coal-specific analysis in Section 5.4.

between 2004-2014.

We also test a secondary dependent variable that is an indicator (0/1) for the *approval* of at least one thermal power plant application, again in a constituency during an election period. The data source is the same, but now only applications which eventually received clearance are coded as positive outcomes, and the coding is based on the time of the application.

While the web scraping process we utilized to obtain information on environmental clearances provided us with a complete list of thermal power projects in the approval system, it also presented challenges due to incomplete information on the exact location and date of the application for some observations. To resolve this issue, we attempted two strategies. For missing dates, we first systematically extracted date information that was coded into the Ministry's project identifier codes and then hand coded the remaining observations by reviewing documentation attached to the application available on the Ministry's website. For location, we matched village and tehsil names with GIS data on administrative boundaries and then attempted to match each thermal plant to online databases that contained exact coordinates of proposed plant locations.[17] We then verified GIS point data by matching it with administrative data and available satellite and project data from google searches. Finally, we overlaid the verified point data for spatial data on political constituencies to obtain a final count variable of thermal project applications and approvals per constituency-period.

The focus of this paper is on the clearance process—applications and approvals—and not on the content of the applications themselves or the eventual outcomes of the projects proposed. However, for descriptive purposes we collect data to verify final result of the coal plant applications in our dataset. Of the 567 coal plant proposals, we found that at least 220 (39%) were eventually constructed.[18] We estimate that these 220 plants produce a total estimated output of 162,945 MW, which suggests that the potential for political distortions to influence the provision of energy and environmental public goods in India is considerable.

[17]Specifically, we consulted information on the `http://www.greenclearancewatch.org` and `http://www.sourcewatch.org` webpages which accumulate data on environmental clearances and coal projects in India and other countries.

[18]This may slightly underestimate the actual construction rate as we were unable to verify outcomes for a small subset of projects that involved extremely small thermal units (typically with output of 20 MW or under) intended to provide power for a specific business (such as a textile factory).

4.2 Explanatory Variable: Politically Aligned Politicians

The discontinuity design allows us to make inferences about the causal effects of legislator characteristics on environmental clearances. We focus on the political connections of candidates: specifically, their partisan alignment with higher level political actors. We therefore code each winning and losing candidate as aligned if they are a co-partisan of the state chief minister. We opt to study alignment at the state rather than national level. This approach has practical benefits from an inferential perspective: a single prime minister held office during the period under study, meaning it is not possible to disentangle the effect of political alignment from the party-specific impact of the Indian National Congress. It is also in line with existing evidence that find the alignment between a chief minister and local politicians matters, as discussed previously (Iyer and Mani, 2012).

For this analysis we focus solely on legislators that share the same party as the chief minister, ignoring broader coalition alignments. While this same theoretical mechanism can function for coalition partners, political coalitions between parties in India tend to re-form following elections in order to build a ruling government in parliament. Thus, coalition alignment is a post-treatment variable as it is largely dependent on the specific results of any particular political contest. As such it does not meet the requirements of our identification strategy, which requires an ex ante understanding of a given unit's eligibility for treatment assignment.

4.3 Identifying Assumptions

The regression discontinuity design allows for the estimation of causal effects using observational data based on a set of assumptions regarding treatment assignment. A key feature of the design is that treatment (the election of politically-connected candidates within a district) is determined based on a cutoff point—in this case, a candidate achieving a vote share greater than that of the strongest opponent. The running variable in this design is the vote margin of a politically-connected candidate relative to the strongest opposing candidate.[19] There is a sharp cutoff at zero: districts where the running variable is positive receive the treatment, and districts where the running variable

[19]In order to ensure that all units within the sample have a non-zero probability of being selected into treatment or control, we select only cases where exactly one of the top two vote-getters possesses the relevant characteristic.

is negative do not.[20]

Contingent on two key assumptions, this design allows for the causal identification of treatment effects locally around the cutoff point (Lee and Lemieux, 2010). First, this approach requires that subjects (electoral districts) have imprecise control over the running variable: they must not be able to manipulate relative vote share with exactitude. An implication of this assumption is a prediction that treatment assignment is randomized in close proximity of the cutoff point. In other words, there should be no systematic differences between districts where an aligned candidate wins by a small margin (such as a percentage point) and those where such candidates lose by the same margin. The second assumption is that other variables contributing to outcomes do not also see a discontinuity at the cutoff. This assumption allows us to infer that differences in outcomes on either side of the cutoff are attributable to the treatment of interest. We examine these assumptions and provide robustness checks in Section 5.6 below.

5 Findings

5.1 Demand for New Power Plant Approvals

We first examine results of our regression discontinuity models that test the effect of MLA characteristics on the probability that an application for an environmental clearance for a thermal power is submitted during a given election cycle. Figure **??** depicts results for the RD model using an MLA's political alignment as the primary independent ("treatment") variable of interest. Rather than provide full results from each model specification here, we present just the coefficient and confidence interval estimates for ease of comparison. The y-axis plots the size of the resulting point estimate and the x-axis plots different bandwidths for the cutoff point of the running variable in our design (vote margin).

To avoid issues of bandwidth selection and increase transparency in presentation, we present results from sharp RD estimation at a range of bandwidths from vote margins of 1-10 percentage points. By showing the different estimates across ten different bandwidths, we offer a transparent summary of the estimated effects and their robustness to differing sample restrictions. The number

[20]Note that this sharp cutoff refers to the relative voteshare of the top two candidates, but the total voteshare of a treated candidate may vary as is standard in multi-cutoff designs (Cattaneo et al., 2016).

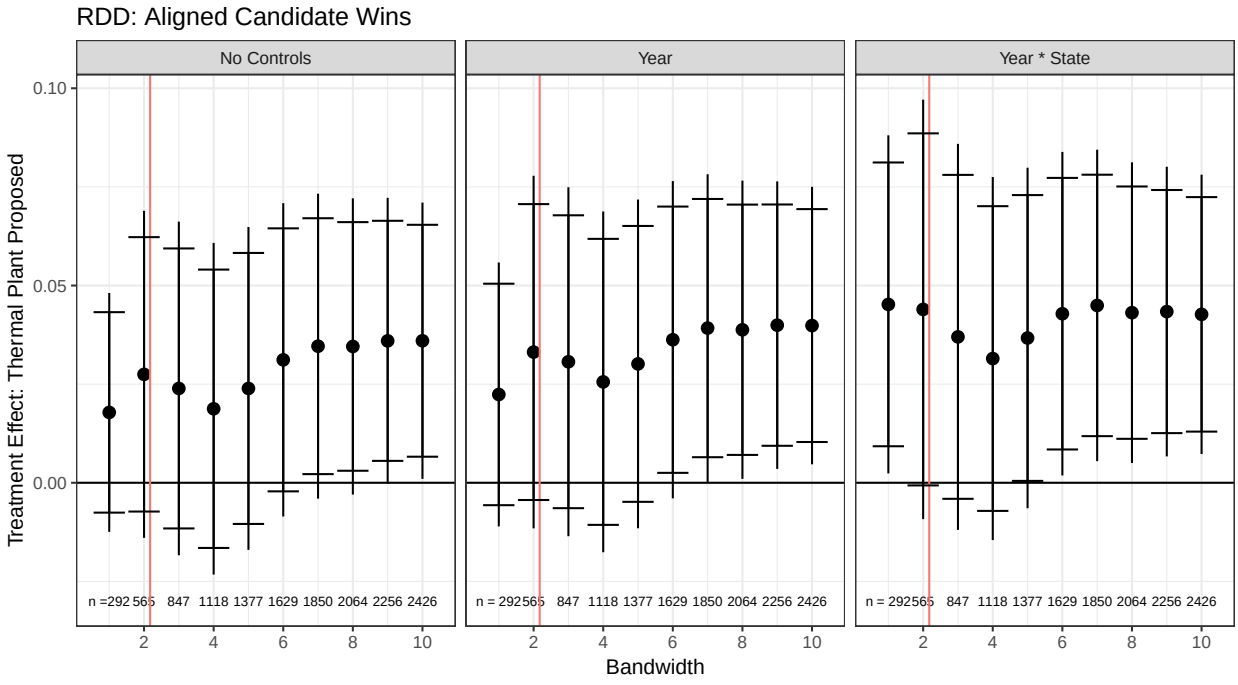

Figure 2: RD Estimates: Alignment Treatment on Environmental Clearance Applications (all thermal plants). Figure shows treatment effect estimates for ten different bandwidths of the running variable (percentage point vote margins). The number of observations in each model is included at the bottom of each plot. Horizontal and vertical lines indicate 90- and 95-percent confidence intervals, respectively.

of units included within each bandwidth is indicated at the base of the figure. Point estimates are indicated with a black circle and 90- and 95% confidence intervals are shown with horizontal and vertical bars, respectively. The location of the Imbens and Kalyanaraman (2012) optimal bandwidth is shown for reference on each plot as a red vertical line.[21] We estimate the effect of the independent variable using three sets of model specifications: (1) without additional control variables; (2) including only election year fixed effects; and (3) including both year and state fixed effects. We present results for each set of models in a separate panel for comparison.

[21]The selection of bandwidth is the subject of substantial discussion in the methodological literature on regression discontinuity designs. The Imbens and Kalyanaraman (2012) bandwidth seeks to minimize the mean squared error of the RD point estimates; other approaches make more explicit efforts to address the potential for bias in constructing a bandwidth (Calonico, Cattaneo, and Titiunik, 2014). In this case, rather than seeking to inductively identify the optimal bandwidth based on our data, we adopt the generic and transparent approach of estimating and reporting models from a wide range of bandwidths. This also helps to address the challenges produced by using an outcome variable in which positive events are rare, which may generate additional noise when the number of observations is small.

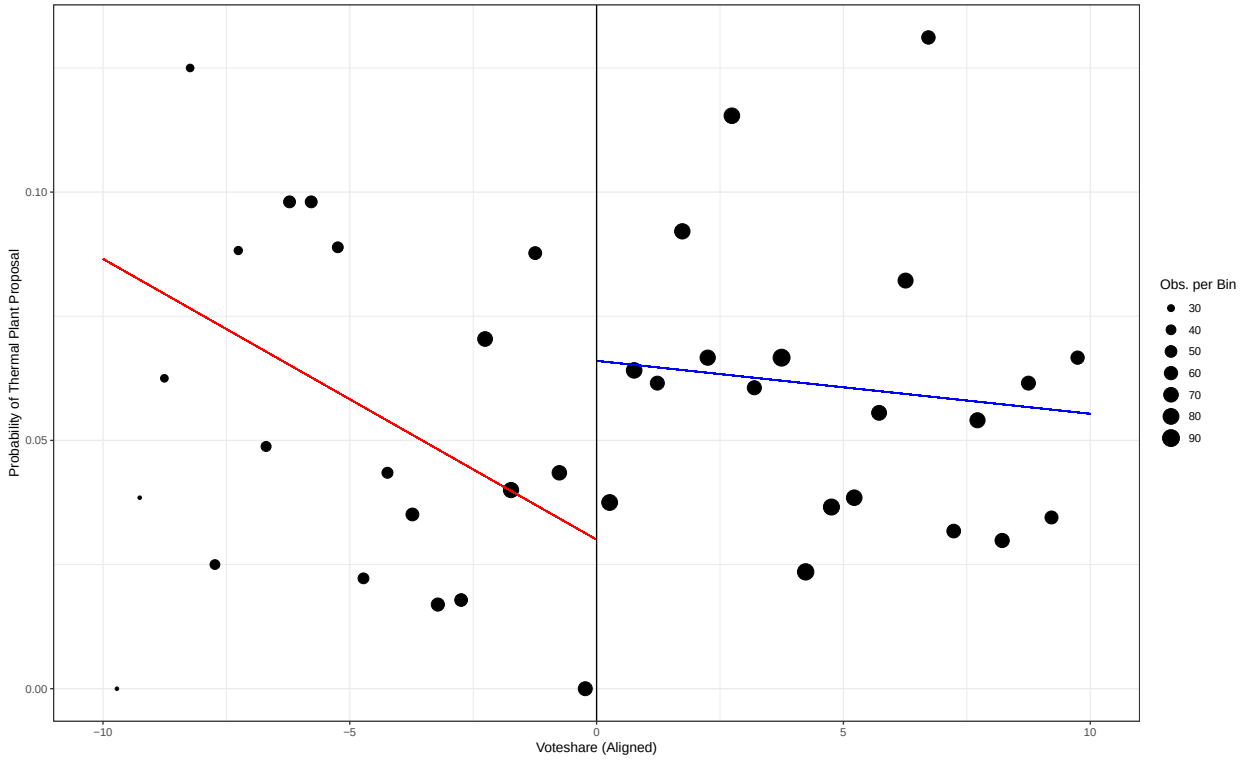

Figure 3: Alignment on Environmental Clearance Applications (all thermal plants): Binned Data and Model Estimates. This figure plots binned data with binwidths of half a percentage point on either side of the cutoff alongside RD model estimates from a bandwidth of 10 percentage points.

The election of politically-aligned candidates appears to exert a positive impact on the probability that a thermal plant is proposed during the subsequent electoral term. Figure **??** reveals that in the vicinity of the cutpoint, the election of a politically-aligned candidate increases the likelihood that at least one plant is proposed by roughly 2-3 percentage points—a massive impact given that only 5.6% of the sample saw proposals. The RD results are consistent across a range of bandwidths and to the inclusion of controls, testifying to the robustness of the estimate. Figure 3 offers a visualization of the findings with respect to alignment: this plots local sample means of the raw data, with bin widths of half a percentage point and point radius corresponding to the number of observations included in each bin (Skovron and Titiunik, 2015). The binned means are overlaid with the linear model estimates on either side of the cutpoint from the RD model with no controls and a bandwidth of ten percentage points (Figure **??**).

To complement the causal estimates provided and address concerns about possible localized

treatment effects and external validity (see Section 4.3), we also examine effect estimates across the full sample—that is, with a bandwidth extending up to 100 percentage points.[22] Figure 4 presents RD effect estimates for this broader category of units. While these results can provide evidence that our above findings likely apply to a broader range of elections, and not merely closely contested races, they require stronger assumptions for causal identifications as there is no plausible assumption of "as-if" random sorting around a sharp cutoff point. Therefore caution should be used in interpreting these supplementary results. Nonetheless, this evidence is consistent with the preceding findings, and suggest that the relationships found in our sample of close elections are valid across a wide range of electoral scenarios. Again, we find evidence that the election of politically-aligned winners is associated with a higher probability of proposals during the subsequent electoral term: with controls, the estimated effects are significant at the 0.1 level.

5.2 Approval of New Power Plants

The preceding analysis examines the impact of party alignment on new *applications* for environmental clearance, that is, the effect on the demand for new project approvals. However, does this increase in demand actually translate into an increase in new thermal plant construction? In other words, is this effect constrained to the speculation of project promotors or does it also cause more projects to be approved?

In Figure 5, we present analysis of the effects of MLA political alignment on new thermal project *approvals* as the outcome of interest. Here, we code observations as 1 if any thermal project was proposed during the constituency-period that ultimately received clearance; otherwise, observations are coded as 0. The results with respect to alignment are consistent with the findings with the application outcome: coefficients are positive across all ten bandwidths, though estimates are somewhat noisier.[23] This is suggestive that party alignment between MLAs and state government does lead to an increase in approvals of new power plants, and that project promotors are not merely speculating that aligned MLAs can help push projects through the environmental clearance

[22] We do, however, restrict the sample to observations in which only one of the top two vote-getters was politically aligned with state government (e.g. one aligned candidate and one non-aligned candidate). In other words, we include only units that were eligible—in theory—to be assigned to both "treatment" and "control."

[23] The added noise may follow in part from the reduced number of positive outcomes in the sample, as roughly 62% of our sample had received clearances at the time of data collection.

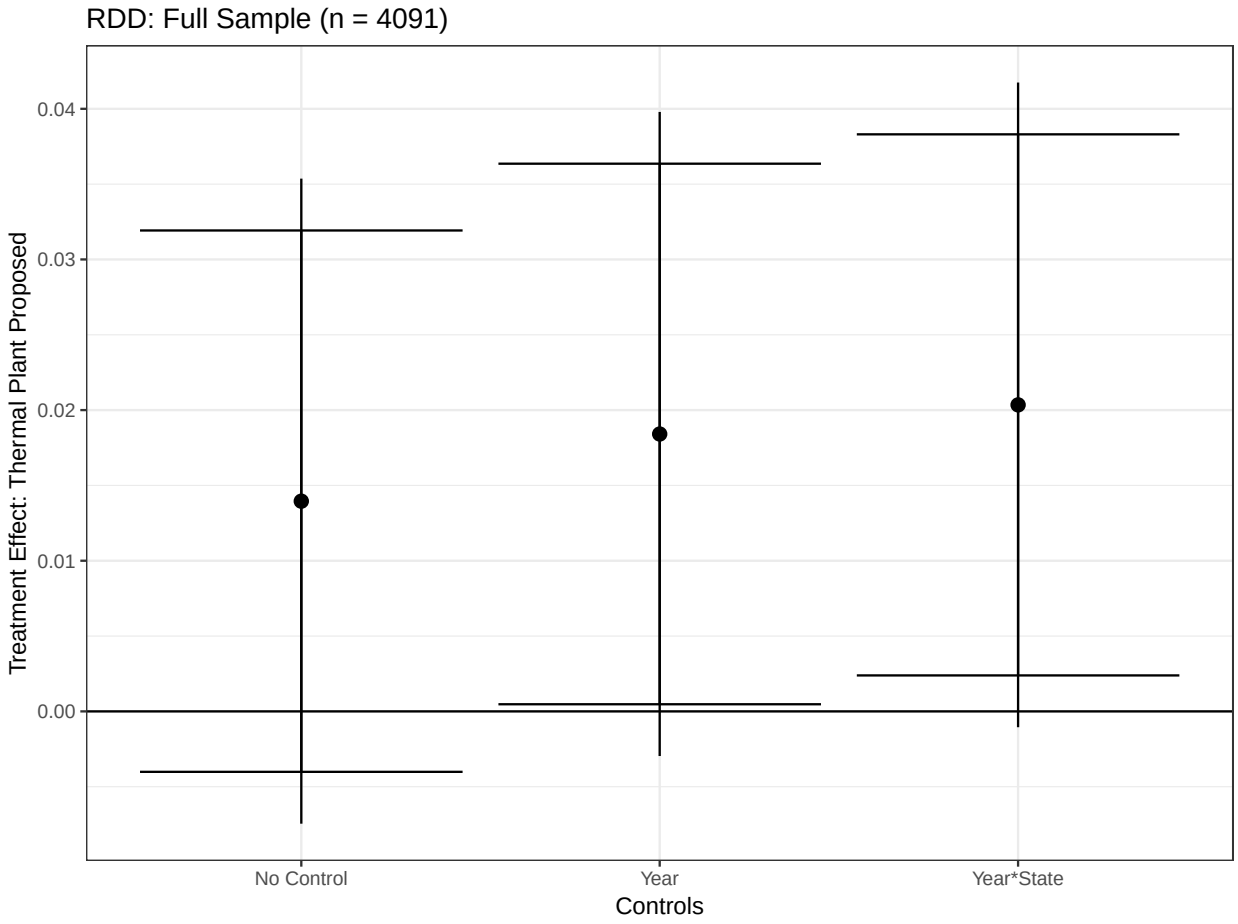

Figure 4: RD Estimates: All Treatments on Environmental Clearance Applications (all thermal plants), Full Sample. Figure shows treatment effect estimates for models with and without controls, for a bandwidth of 100 percentage points. The full sample includes 4091 election-years. Horizontal and vertical lines indicate 90- and 95-percent confidence intervals, respectively.

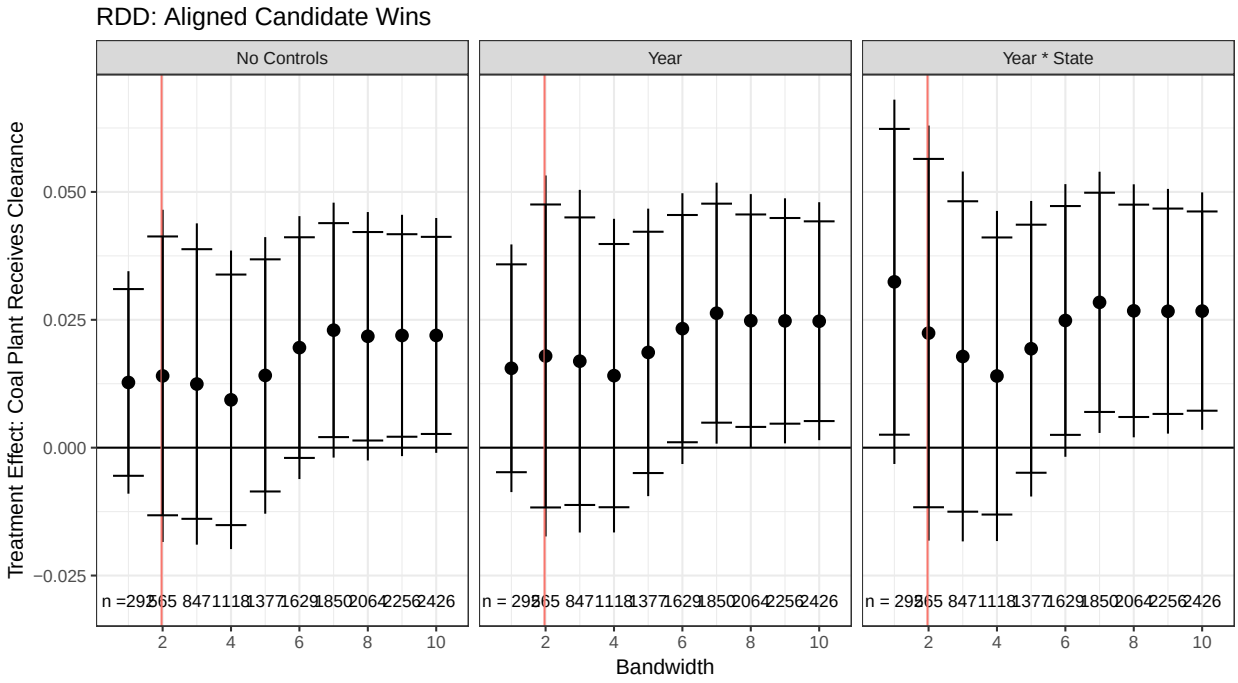

Figure 5: RD Estimates: Alignment Treatment on Environmental Clearance Approvals (all thermal plants). Figure shows treatment effect estimates for ten different bandwidths of the running variable (percentage point vote margins). The number of observations in each model is included at the bottom of each plot. Horizontal and vertical lines indicate 90- and 95-percent confidence intervals, respectively.

process.

5.3 Timing of Applications—Electoral Cycles

We probe the alignment result further by examining the timing of applications relative to the election period. If electoral results matter for proposals, we would expect to see the effects of electoral business cycles, that is, the concentration of new applications around important electoral moments. Specifically, we predict an increase in new applications in the first few years after an election, as this would allow an application sufficient time to navigate the clearance process while benefiting from a relatively propitious political climate. Submitting a proposal too late in an electoral term poses a riskier proposition, especially in competitive scenarios where a non-aligned challenger has a good chance of victory in the next election, as the incumbent might be voted out before the clearance is processed. Of the thermal plants that received approvals in our dataset,

roughly 80% saw those approvals come within three years of initial submission, indicating a five-year electoral term represents sufficient time to complete the clearance process. If would-be coal barons seek to take advantage of a friendly political environment, however, we would expect them to do so relatively early in the election period in order to ensure that the sometimes lengthy clearance process is complete before the next election.

To test this prediction, we code thermal plant applications according to the year in the electoral cycle in which they were first proposed. Because elections occur in different months and some applications do not have precise dates of first submission, we drop observations from the election year itself (year 1) as it is not possible to differentiate between plants proposed at the end of the preceding term or directly following the elections. We conduct our analysis on subsets of the application data by grouping proposals during the first two years both preceding and following an election year. Our unit of analysis is thus a two year period within constituencies either before or after an election, rather than a full five-year electoral term. We perform the same estimation procedures as in the main analysis and present results in Figure 6.

In line with our expectations, we find that the effect of the election of an aligned politician on thermal clearance applications varies substantially across the election cycle. Notably, RD estimates on outcomes in the first two years of a term are consistent across bandwidths and similar in magnitude and significance to those identified across the full term. Looking solely at the last part of the term, however, the effect of electing an aligned politicians dissipates: point estimates lose significance and range from negative to positive across bandwidths.[24]

This finding provides strong support for our assertion that the election of a politically aligned local politician incentivizes demand for new thermal project approvals. It is only when uncertainty about the near term identity of a politician is resolved that the election influences developer decisions; when electoral uncertainty resurfaces towards the end of a term, the incumbent alignment effect disappears. While the MLA might prefer applications a year or two before the elections, when costly campaigning is on the horizon, it would be irrational for the project developer to finance an

[24]That the effect sign changes along with bandwidth may be interpreted as a null result. An alternate interpretation might be that in constituencies with especially close elections, applications decrease during the last years of a term due to expectations that the incumbent might lose in the approaching contest. For somewhat "safer" seats (i.e. as bandwidth increases), applicants may feel more confident the administration will last into another term.

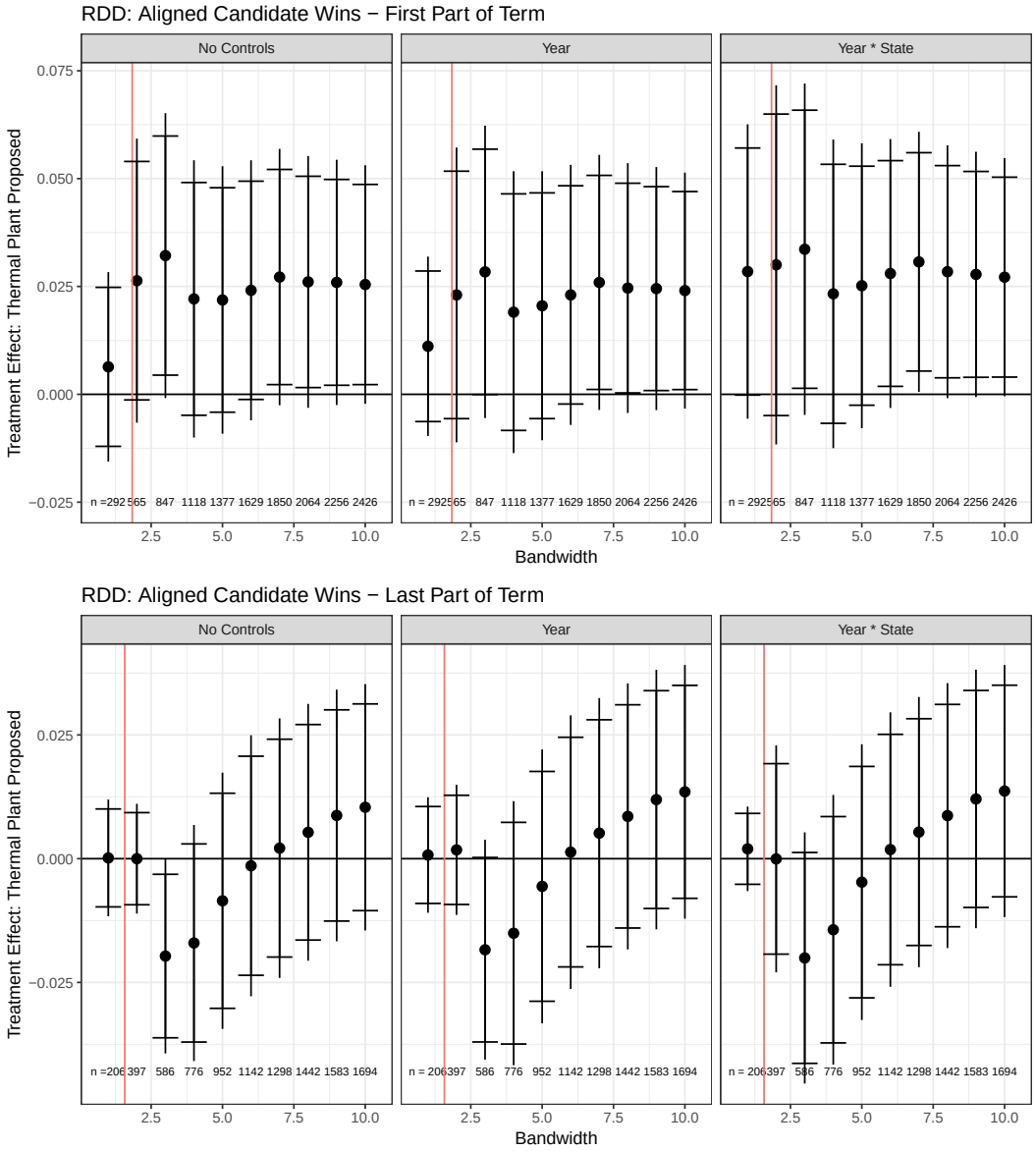

Figure 6: RD Estimates for Sub-Election Cycle Periods: Alignment treatment on environmental clearance applications. Upper plot units are the two year period following an election; lower plot units are the two year period preceding an election. Figure shows treatment effect estimates for ten different bandwidths of the running variable (percentage point vote margins). The number of observations in each model is included at the bottom of each plot. Horizontal and vertical lines indicate 90- and 95-percent confidence intervals, respectively.

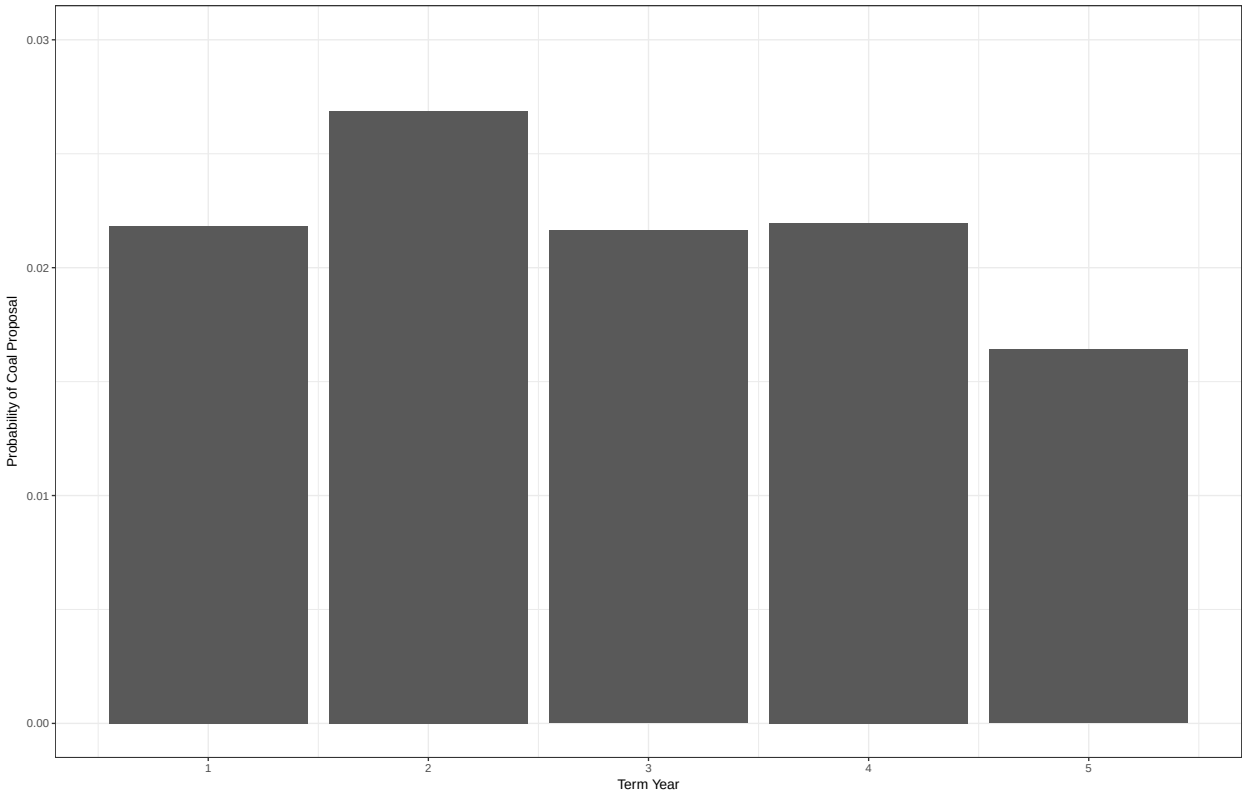

Figure 7: Probability a Thermal Power Plant is Proposed by Election Cycle Year. Distribution of thermal plant proposals relative to the electoral cycle, normalized by the total number of years in our dataset.

MLA who is possibly facing elections before the environmental clearance process is over. Here the project developer's first-mover advantage results in a pattern of timing biased toward post-election years.

For reference, we also include a plot showing the probability a thermal power plant is proposed in a district during each year in the electoral cycle (Figure 7). Plants are slightly more likely to be proposed in the year immediately following an election (year two), but the difference in probabilities is very small and flat across the board: the difference in effects in Figure 6 is not driven by a lack of proposals during the later years. Rather, it appears that the election results themselves are prompting a rapid change in the flow of applications, conditional on the partisan alignment of the winner.

5.4 Coal Plant Applications

Although the analysis in this paper has thus far focused on all types of *thermal* power plants, applications and approvals of *coal* plants are of particular interest due to their exceptionally high environmental cost and importance to Indian energy infrastructure. Given the potential tradeoff between the benefits of energy production and the patent environmental consequences of coal-fired energy generation, the welfare consequences for political disturbances in the environmental clearances process for these kinds of projects in particular are quite high. As discussed in Section 4.1, a substantial majority of the plants in our dataset are coal plants. But to what extent does the treatment effect of electing an aligned politician reflect outcomes for coal versus other types of fuel?

In this section we disaggregate the data on thermal applications to compare coal applications to other types of fuel. Figure 8 presents results for the impact of MLA alignment on the probability of new coal-fired power plant applications in a given constituency-election period. Although estimates are noisier than with all thermal generation plants, particularly at low bandwidths where the total number of coal proposals in the dataset was very small, the coefficients are consistently positive and of a comparable magnitude to those identified in Figure **??**. Figure 9, on the other hand, replicates this analysis where the outcome includes only natural gas plants, which present far fewer negative externalities.[25] Here the coefficients are consistently close to zero and insignificant across all bandwidths.

We note that our sample of thermal proposals is small relative to the number of units in our dataset—only 5.6% of units experienced at least one thermal plant proposal. Subsetting the data to look at different types of thermal plant reduces the precision of our estimation technique. However, despite these limitations, the coefficient estimates found here provide evidence that the main findings in this paper are driven by coal. In particular, they suggest that political alignment

[25] Though natural gas plant proposal generally skew slightly smaller than coal plants (the average gas plant proposed had a capacity of 780 MW, compared to 990 MW for coal plants proposed), we do not expect that this factor alone can account for the substantive difference in estimated effects. The capacity distribution across fuel types is generally fairly comparable (see Figure A4 in the appendix). Roughly 30% of natural gas plants proposed were larger than 1000 MW and ranged up to 7200 MW – the largest plant proposed in our dataset. In Appendix A3.2, we further explore potential size-based treatment effects.

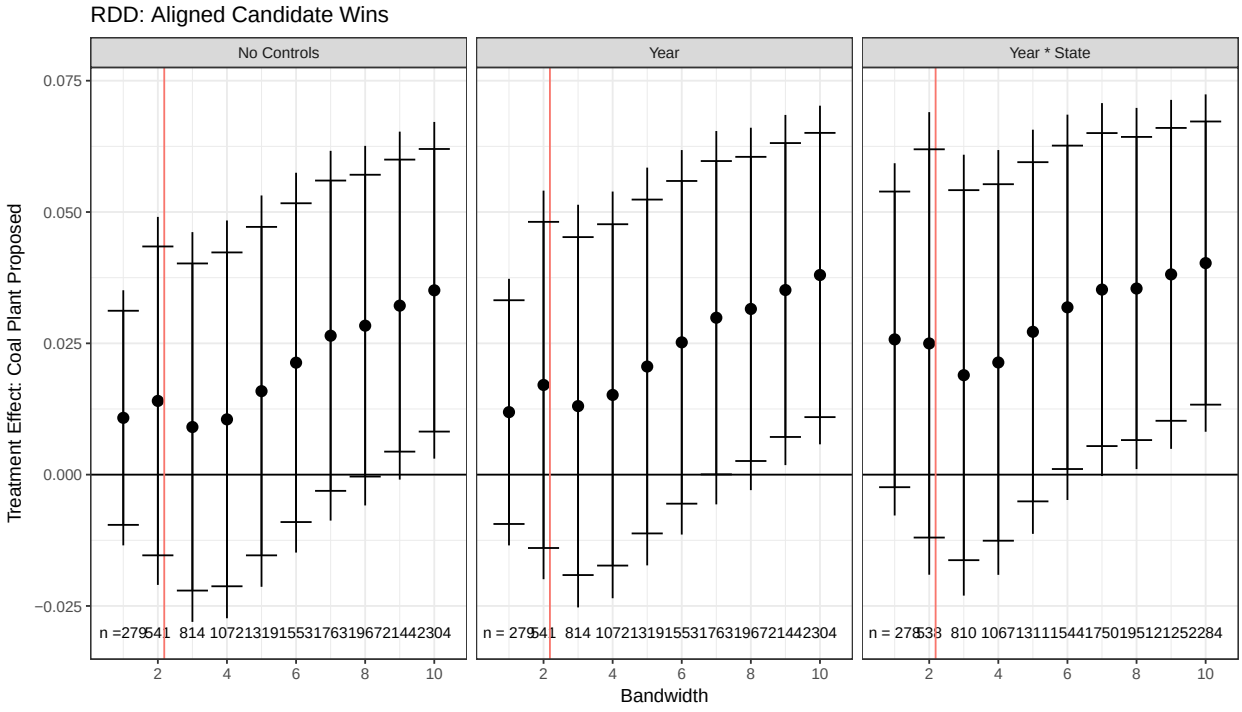

Figure 8: RD Results: Alignment on Environmental Clearance Applications (coal plants only). Figure shows treatment effect estimates for ten different bandwidths of the running variable (percentage point vote margins). The number of observations in each model is included at the bottom of each plot. Horizontal and vertical lines indicate 90- and 95-percent confidence intervals, respectively.

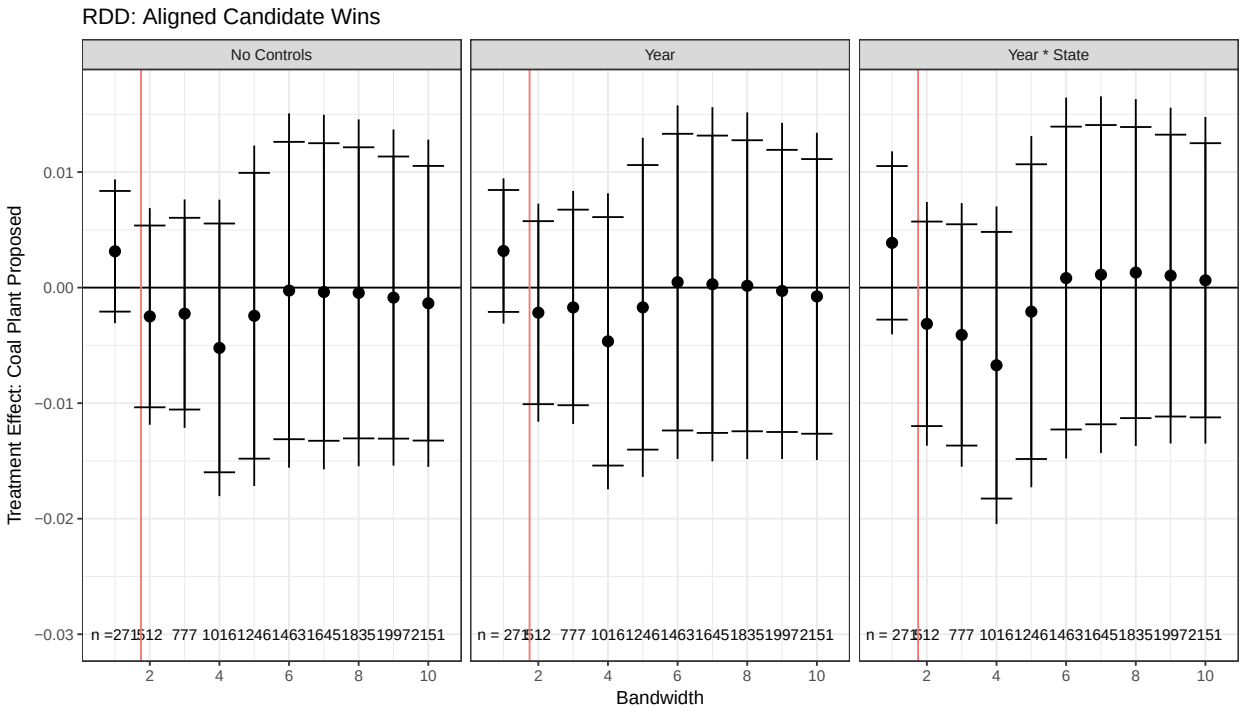

Figure 9: RD Results: Alignment on Environmental Clearance Applications (natural gas plants only). Figure shows treatment effect estimates for ten different bandwidths of the running variable (percentage point vote margins). The number of observations in each model is included at the bottom of each plot. Horizontal and vertical lines indicate 90- and 95-percent confidence intervals, respectively.

matters for coal proposals but has no effect for natural gas applications. We argue that this is evidence that use of the more general thermal plant indicator elsewhere in our results provides the useful benefit of increasing the precision in our analysis and is generally indicative of the effects of these political characteristics on coal plants in particular.

5.5 Vertical Partisan Alignment

We have hypothesized that partisan alignment between district and state-level politicians helps to 'grease the wheels' of the environmental clearance process. This is consistent with qualitative evidence that local politicians can interfere positively or negatively on large projects within their district. Yet the mechanism underlying the alignment effect remains unclear – particularly because clearances are determined at a national rather than state level. So why does district and state partisan alignment matter for this process?

We argue that the state chief minister can use his or her influence on behalf of local politicians from the same party. But the nature of this influence – particularly for a process that takes place through a centralized institution such as the EAC – may vary based on the national-level influence of the party in question. In particular, parties that are a part of the national governing coalition are likely to have more ability to favorably influence outcomes at the national level, such as environmental clearance decisions.

We therefore look for evidence that the main alignment effect varies by party: specifically, whether the chief minister is from a party that belongs to or operates outside the national governing coalition. To look at this added layer of vertical alignment, we conduct a split sample test of our main results among settings where the chief minister is in or outside of the national coalition. The results are shown in Figure 10. We find suggestive evidence that our main results are largely driven by outcomes in settings with state- and national-level partisan alignment: for coalition members and supporters, the effect of local and state alignment is always positive and significant at the 0.05 level for bandwidths between six and ten percentage points. Though the estimated alignment effect for non-members is also positive, at larger bandwidths it drops to around half the magnitude seen for coalition members and is considerably noisier. Though this does not allow us to fully reject the possibility that district and state alignment matters even when the party in question is

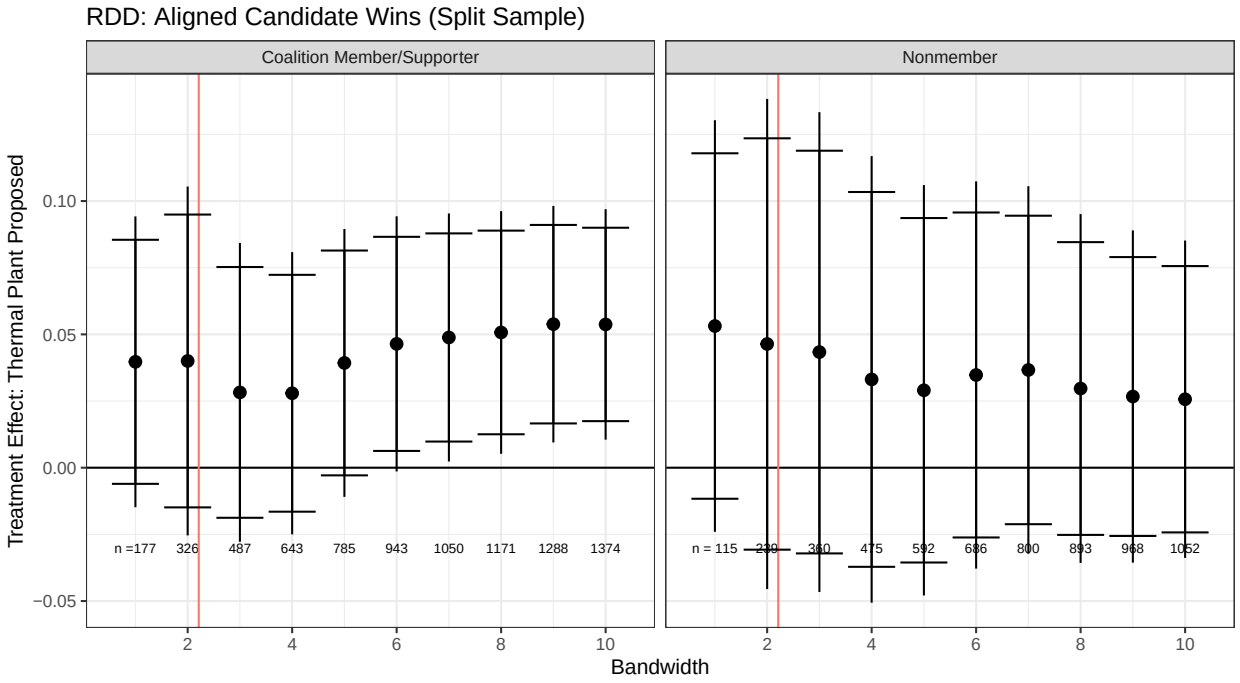

Figure 10: RD Results: Alignment with National Level. Figure shows treatment effect estimates for ten different bandwidths of the running variable (percentage point vote margins). Sample is divided to include cases in which the state chief minister's party was a member of or supporter of the national governing coalition (left panel) and those in which his or her party was not a part of the governing coalition. Specifications include state and year fixed effects.

not a member of the national coalition, the split sample evidence suggests that the effect is more consistent when vertical alignment is present.

5.6 Robustness Checks

As noted above, the regression discontinuity design we employ can provide causal evidence of treatment effects given certain assumptions regarding the as-if random sorting around the running variable cut-off point (here, winning candidate's voteshare). We examine these assumptions in two ways: first, by conducting a balance test to verify that pre-treatment covariates do not also see a discontinuity at the cutoff point, and second, by conducting a McCrary (2008) density test to search for evidence of sorting around the cutoff. Balance statistics for our treatment category are shown in the Appendix Section A2.

These are calculated by estimating RD models for a battery of eighteen pre-treatment, candidate-

and district-level variables using the same running variable as in the main analyses. If treatment assignment is randomized in the neighborhood of the cutoff, we should see no evidence of systematic variation between treatment categories. We find that the pre-treatment covariates are very well balanced across treatment categories: for districts in which a politically aligned candidate won or lost by a small margin, none of the eighteen covariate models return coefficient estimates significant at the 0.05 level. Overall, the results suggest a sample that is very balanced on observables, lending credence to the assumption of locally randomized treatment assignment.

We also conduct a McCrary (2008) density test to assess continuity of each of the three running variables around the cutoff (Section A2). Politically aligned candidates are, on average, somewhat more likely to win than their unaligned counterparts, but the histogram does not reveal an obvious or statistically significant discontinuity at the cutoff. However, to avoid concerns about sorting, we replicate the RD analysis on a "donut" sample, dropping the units closest to the cutoff (Figure A2).[26] The results are largely unchanged by this check.

While the underlying assumptions of the RD approach are not directly testable, the above robustness checks offer suggestive evidence that they may hold in this context. Given these assumptions' validity, we are able to obtain a causal estimate of the impact of aligned candidates winning an election on thermal power plant proposals during the subsequent political term. Note that this estimate is necessarily local to the cutoff: our estimate is derived explicitly from very close elections. However, because the elections in question require a plurality of votes and candidates in the sample win with a wide range of voteshares, the sample analyzed includes treated candidates winning or losing in diverse electoral circumstances.[27] We therefore undertake additional analysis to test for heterogeneity of treatment effects at different voteshare cutoffs in the appendix but find little evidence to suggest variation in effects (see Appendix Section A3). Our results, then, while specific to competitive elections, are general to a range of electoral scenarios, including treated

[26] If units are able to partially sort around the discontinuity threshold (that is, manipulate the results of very close elections), it may bias the results. To test whether a possible discontinuity around the cutoff biases results, we drop the closest observations and compare the results.

[27] India has a large number of political parties and there is substantial variation in terms of the number of competitive parties within a district. A narrow vote margin between the top two candidates may therefore reflect a head-to-head contest where one candidate receives 51% of the vote to the other's 49%, or it may reflect a more open competition in which the winning candidate narrowly beats out two or more competitors.

candidates winning with a plurality to an outright majority of the vote.

The above limitation also implies a scope condition on our analysis, as we can only causally estimate the effect of politician alignment in close elections (De la Cuesta and Imai, 2016). This is an important limitation of regression discontinuity designs that excludes some scenarios of interest: we cannot, for example, test the effect of entrenched networks of partisan alignment in scenarios where established politicians exert secure political control over a constituency. By their very nature, such constituencies would not present variation in the identity of the politician necessary for our empirical design. Despite this limitation, however, we are confident in the relevance of this study for Indian politics, as close elections comprise the majority of local elections: the median margin of victory for elections in our dataset was eight percentage points, and only a quarter of the races in a sample had vote margins of more than fourteen percentage points. Even with the added restriction of treatment eligibility, our estimates are derived from a relatively large subset of the total universe of cases.[28] In addition, to underscore our causally-identified findings, we include observational analysis of the treatments on the full range of electoral outcomes in Figure 4, with very similar results.

6 Conclusion

Environmental regulation is widespread, and its use is motivated by the negative externalities of economic activity. Political economists have, however, noted that regulatory authority allows the government to influence economic activities for political purposes as well. Here we have contributed new theory and evidence from the environmental clearance process for thermal power plants in India—an effect that for practical purposes, is driven primarily by coal-fired power plants. We have found that partisan alignment between MLAs and state governments can increase the demand for (and approval of) new environmental clearances, suggesting that this political outcome may "grease the wheels" of the clearance process. When candidates aligned with the state chief minister win elections, there is a sharp increase in the number of applications for clearances in their constituencies—and these applications are typically approved within a year or two. The results

[28] In Figure **??**, the estimate at the widest bandwidth of ten percentage points includes more than 2400 observations out of the total sample of 6137.

are all the more remarkable when one considers that MLAs have no formal role whatsoever in the environmental clearance process.

The findings offer a notable contribution to the literature on the political economy of regulation. To begin with, our study is among the first to identify the causal effect of this alignment characteristic on environmental regulation. Theories of "regulatory capture" have proposed this possibility for decades and in-depth qualitative studies abound, but there are few well-identified quantitative studies that estimate the magnitude of the effect. Our study establishes a causal relationship between partisan alignment and accelerated environmental clearances, highlighting the importance of political considerations in environmental impact processes that are intended to be technocratic and unbiased.

In addition our findings offer several interesting avenues to study the political economy of environmental regulation. One is to consider the politics of environmental regulation in different political systems. In India, our most striking finding is that state-level politicians can shape regulatory politics at the central level without having any formal role in the system at all. In more centralized political systems and under authoritarian rule, such influence could be even stronger. Indeed, extending our study beyond the year 2014 would be interesting, given India's more unified central government under Prime Minister Modi. The theoretical implications of this change are not entirely clear, as a unified government could either amplify or diminish the importance of alignment. In the amplifying mechanism, MLA alignment is more important than ever because a unified central government actively directs rents to aligned constituencies. In the diminishing mechanism, MLA alignment is less important because isolated opposition candidates have little influence when faced with a unified central government. For another example, studying the politics of coal-fired power plants in China or Vietnam could be a theoretically fruitful and substantively important direction of study. Another potential extension of our approach might examine other legislative characteristics predicted to influence bureaucratic function, such as evidence of corrupt behavior.

However, a word of caution is necessary when interpreting our findings. While we find consistent causal evidence that local political alignment increases the demand for environmental clearances and the number of projects ultimately approved, we cannot determine whether this increase results

in net boon or drain on public welfare. This is because we are unable to estimate the baseline level of efficiency of the environmental clearance process. If the central process is overly restrictive by adding additional costs to the construction of new plants, political alignment may present a net increase in public welfare, as new sources of electricity are brought on line. However, if this greasing of the regulatory wheels is reducing central oversight, this may result in an increase in negative externalities and public burden due to new sources of air pollution.

In either case, our research demonstrated that political considerations are a fundamental part of regulation in political systems such as India's, be it through environmental regulation or in other domains. When connected and powerful politicians, project developers, and other interests exercise undue influences on the regulatory process, there is a strong potential to lose the benefits of such regulation and increase costs. In our application, political alignment may or may not increase overall investment in coal-fired power generation, but it does implicate that some proposals may receive less scrutiny and oversight than others. In this setting, proposals that feature a poor balance of costs and benefits, as well as limited safeguards to minimize harm, can turn into concrete investments that cause damage for decades to come. Our findings suggest that India's environmental clearance processes could be improved by insulating the regulatory decision-makers from informal influence by state-level politicians and their industry connections. While participatory processes at the local level can play an important role, they should not empower government-aligned politicians and their allies to expedite certain environmental clearances over others. One approach would be to monitor the local process better to ensure that all sides are heard, regardless of their political clout. While such monitoring is always imperfect, it could reduce imbalances by raising to the cost of heavy-handed lobbying tactics.

Political science can play an important role in identifying and explaining biases that stem from political considerations, and we hope that our research creates new opportunities for political economy research in the regulatory realm. The Indian case exemplifies the reality of regulatory processes that seem neutral and unbiased on paper, yet generate politically biased results through informal processes. Exploring this possibility in other regulatory domains and across the world could yield important theoretical and policy-relevant insights.

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Greasing the Wheels: The Politics of Environmental Clearances in India
Supporting Information

January 20, 2021

Contents

A1 Data Description

The primary unit of analysis for this project is a district-election period for state assembly constituencies (ACs). State assembly elections are staggered and terms last a period of five years. Our data on elections and coal proposals run from 2004-2013. In addition to our primary treatment indicators and outcome variables, we compile data on election outcomes (voteshare, turnout, number of electors, and whether or not a woman was elected) and on district-level indicators using data from the 2001 census.

Table A1 presents summary statistics from our full sample of 6,137 AC-election periods. For our RD analyses, we subset the full sample to cases where a treated candidate (one aligned with the chief minister) was either the winner or second-place loser of an election, but not both. This ensures that all units included in the analyses had a non-zero probability of being assigned to treatment or control. We include summary statistics for this subset in Table A2. The main outcome variable, a dummy indicator for whether or not at least one coal plant was proposed in a district-period, remains extremely consistent with 5.6% of units seeing a proposal in both the full sample and subset.

Statistic	N	Mean	St. Dev.	Min	Max
Coal Plant Proposed	6,137	0.056	0.229	0	1
Num. Coal Plants Proposed	6,137	0.094	0.476	0	8
Criminal Elected	6,137	0.298	0.458	0	1
Serious Criminal Elected	6,137	0.152	0.359	0	1
Chief Minister Aligned	6,137	0.435	0.496	0	1
Woman Elected	6,137	0.082	0.275	0	1
Voteshare of Winner	6,137	44.298	9.491	15.800	87.362
Population	6,069	201,297.600	110,359.600	66	865,462
Area	6,069	67,895.600	79,905.600	0.000	2,586,538.000
Prop. Irrigated Land	5,943	0.299	0.239	0.000	1.000
Prop. Scheduled Caste	6,069	0.178	0.108	0.000	0.878
Prop. Scheduled Tribe	6,069	0.116	0.213	0.000	1.000
Prop. Literate	6,069	0.497	0.146	0.000	0.910
Prop. Employed	6,069	0.486	0.017	0.350	0.569
Local Media	6,069	0.587	0.319	0.000	1.000
Education Facilities	6,069	0.867	0.152	0.000	1.000
Medical Facilities	6,069	0.455	0.285	0.000	1.000
Avg. Bus	6,069	0.752	0.555	0.000	2.000
Avg. Railway	6,069	0.712	0.906	0.000	2.000
Power Supply	6,069	0.840	0.246	0.000	1.000
Avg. Distance to Nearest Town	6,069	19.808	16.179	1.000	208.200
Avg. Household Size	6,069	5.436	0.849	1.528	16.500
Number of Electors	6,137	193,327.100	76,168.510	3,738	1,593,907
Prop. Turnout	6,137	0.691	0.129	0.000	0.965

Table A1: Descriptive Statistics - Full Sample

Statistic	N	Mean	St. Dev.	Min	Max
Coal Plant Proposed	4,091	0.056	0.230	0	1
Num. Coal Plants Proposed	4,091	0.099	0.500	0	8
Running Variable	4,091	4.598	13.327	−51.841	74.338
Criminal Elected	4,091	0.274	0.446	0	1
Serious Criminal Elected	4,091	0.135	0.342	0	1
Chief Minister Aligned	4,091	0.652	0.476	0	1
Woman Elected	4,091	0.083	0.276	0	1
Voteshare of Winner	4,091	44.166	9.267	17.934	85.264
Population	4,043	200,330.100	108,911.100	66	865,462
Area	4,043	75,443.620	89,554.850	0.000	2,586,538.000
Prop. Irrigated Land	3,923	0.301	0.247	0.000	1.000
Prop. Scheduled Caste	4,043	0.174	0.105	0.000	0.721
Prop. Scheduled Tribe	4,043	0.132	0.231	0.000	1.000
Prop. Literate	4,043	0.488	0.138	0.000	0.910
Prop. Employed	4,043	0.485	0.017	0.350	0.569
Local Media	4,043	0.561	0.318	0.000	1.000
Education Facilities	4,043	0.865	0.157	0.000	1.000
Medical Facilities	4,043	0.426	0.267	0.000	1.000
Avg. Bus	4,043	0.711	0.544	0.000	2.000
Avg. Railway	4,043	0.661	0.883	0.000	2.000
Power Supply	4,043	0.859	0.226	0.000	1.000
Avg. Distance to Nearest Town	4,043	20.427	17.581	1.000	208.200
Avg. Household Size	4,043	5.515	0.828	1.528	16.500
Number of Electors	4,091	193,339.300	77,282.580	3,738	1,593,907
Prop. Turnout	4,091	0.688	0.122	0.000	0.953

Table A2: Descriptive Statistics - Alignment RD

A2 Balance Statistics and Discontinuity Tests

In this section we report balance statistics from the regression discontinuity analyses, as well as tests of the basic assumptions in the regression discontinuity design.

A2.1 Description of Variables

We include electoral variables that we expect to be unrelated to treatment, as well as a number of measures drawn from the 2001 census (we avoid using the 2011 census as variables are post-treatment for the majority of our data). Census measures are reported at the village level, so we aggregate to the district level for each variable, as described. Census variables include:

- *Population:* The total population of the AC, produced as a sum of village-level population indicators for all villages within the AC.
- *Total Area:* The total geographical area of the AC, produced as a sum of village-level area indicators for all villages within the AC.
- *Proportion Irrigated Land:* The proportion of irrigated land in the AC, measured by dividing the total amount of irrigated land by the total area of the constituency.
- *Proportion Scheduled Caste:* The proportion of the population that is scheduled caste, calculated as the total number of scheduled caste individuals in the AC divided by the total population.
- *Proportion Scheduled Tribe:* The proportion of the population that is scheduled tribe, calculated as the total number of scheduled tribe individuals in the AC divided by the total population.
- *Proportion Literate:* The proportion of the population that is literate, calculated as the total number of literate individuals in the AC divided by the total population.
- *Proportion Employed:* The proportion of the population that is employed, calculated as the total number of employed individuals in the AC divided by the total population.
- *Local Media:* The proportion of villages in the AC that have local media (newspapers or magazines).
- *Education Facilities:* The proportion of villages in the AC that have education facilities.
- *Medical Facilities:* The proportion of villages in the AC that have medical facilities.
- *Avg. Bus:* The average number of bus facilities per village in the AC.
- *Avg. Railway:* The average number of railway facilities per village in the AC.
- *Power Supply:* The proportion of villages in the AC that are connected to the power grid.
- *Avg. Distance to Nearest Town:* The average distance to the nearest town for villages within the AC.

	Variable	RD_coef	p_val
1	Population	-88.82	0.99
2	Total Area	-162.98	0.98
3	Prop. Irrigated Land	0.02	0.40
4	Prop. Scheduled Caste	0.01	0.13
5	Prop. Scheduled Tribe	0.00	0.95
6	Prop. Literate	0.00	0.99
7	Prop. Employed	0.00	0.97
8	Local Media	-0.03	0.38
9	Education Facilities	-0.01	0.30
10	Medical Facilities	-0.01	0.67
11	Avg. Bus	-0.08	0.16
12	Avg. Railway	-0.02	0.82
13	Power Supply	0.02	0.44
14	Avg. Distance to Nearest Town	-0.45	0.76
15	Avg. Household Size	0.04	0.66
16	Number of Electors	4869.95	0.45
17	Prop. Turnout	-0.00	0.80
18	Election Year	0.38	0.11

Table A3: Chief Minister Aligned - RDD Balance Check

- *Avg. Household Size:* The average household size within the AC, as measured by the total population of the AC divided by the total number of households.

The additional variables are drawn from electoral data:

- *Number of Electors:* The number of electors per AC in the given election year.
- *Proportion Turnout:* The turnout in the AC in the given election year.
- *Election Year:* The election year itself, included in order to test whether there are any time trends.

A2.2 Balance Tables

Table A3 shows the balance statistics for 18 exogenous covariates from the 2001 Census of India (pre-treatment) and the elections. These statistics are calculated by conducting RD analysis with the same running variable (vote margin for each type of treatment candidate) and cutoff as in the main analysis, but with pre-treatment variables as "outcomes." For consistency, each specification uses a bandwidth of 8 percentage points. We report coefficient estimates and two-sided p-values in the following tables.

With respect to the alignment treatment, the sample appears well-balanced across the set of pre-treatment covariates (A3). None of the variables included show evidence of discontinuities around the relevant cutoff: RD estimates are statistically insignificant to the 0.10 level.

A2.3 McCrary Density Test

In this section we report results from a McCrary (2008) density test for continuity. This test looks for evidence of sorting by examining whether there is any discontinuity in the distribution of the running variable on either side of the cutoff. A significant discontinuity may provide evidence of manipulation of the running variable if units seek to sort into one treatment category or another. The test employs local linear regression on a histogram of the running variable.

Figure A1 presents output from a McCrary test applied to the running variable in our RD specification; we use the suggested bin size and bandwidth as per McCrary (2008). The figure depicts the histogram of the running variable with the smoothed line overlaid.

For the alignment treatment, the McCrary test returns a p-value of 0.09 using the default bin size and bandwidth settings: this represents the probability that the discontinuity in the smoothing functions on either side of the cutoff would arise due to chance. The histogram does not reveal any visually obvious discontinuity, and it appears that the calculated bandwidth may oversmooth near the cutoff. This test is sensitive to bandwidth selection (McCrary, 2008), and we note that the significance of the discontinuity estimate is reduced at smaller bandwidths with less smoothing (see Figure A1).

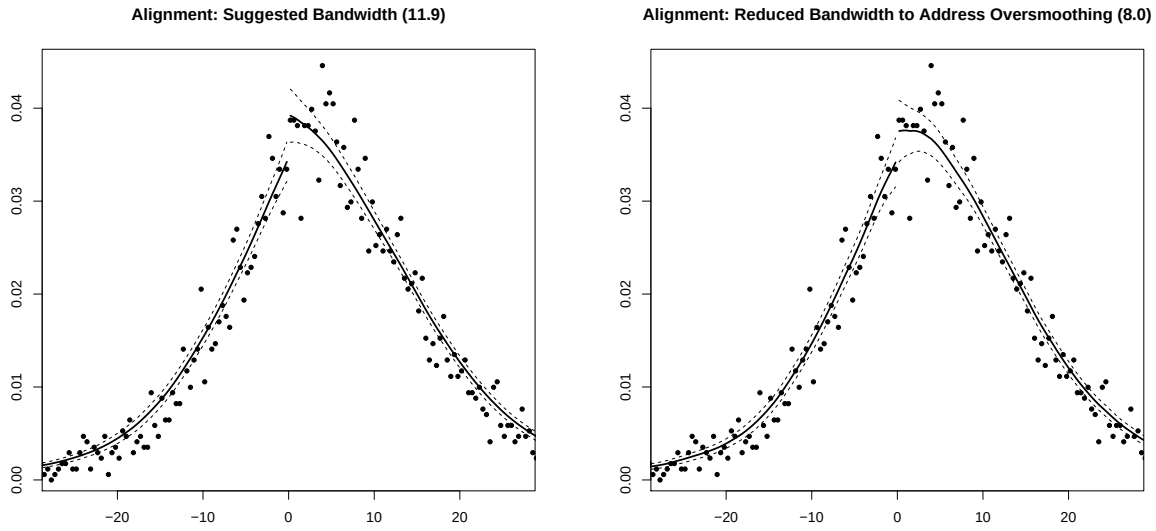

Figure A1: Plot of McCrary Test for Sorting: Alignment Treatment.

There is no clear evidence of sorting. Nevertheless, to address any concerns of sorting very close to the cutpoint, we conduct an additional robustness check, dropping the set of observations closest to the cutoff and repeating our main RD analysis on this "donut" dataset (Figure A2).[1] The effect estimates and their significance change very little at the exclusion of these data points representing the closest races.

[1]We drop observations where the magnitude of the running variable is a quarter of a percentage point or less. This removes roughly 80 observations from our dataset.

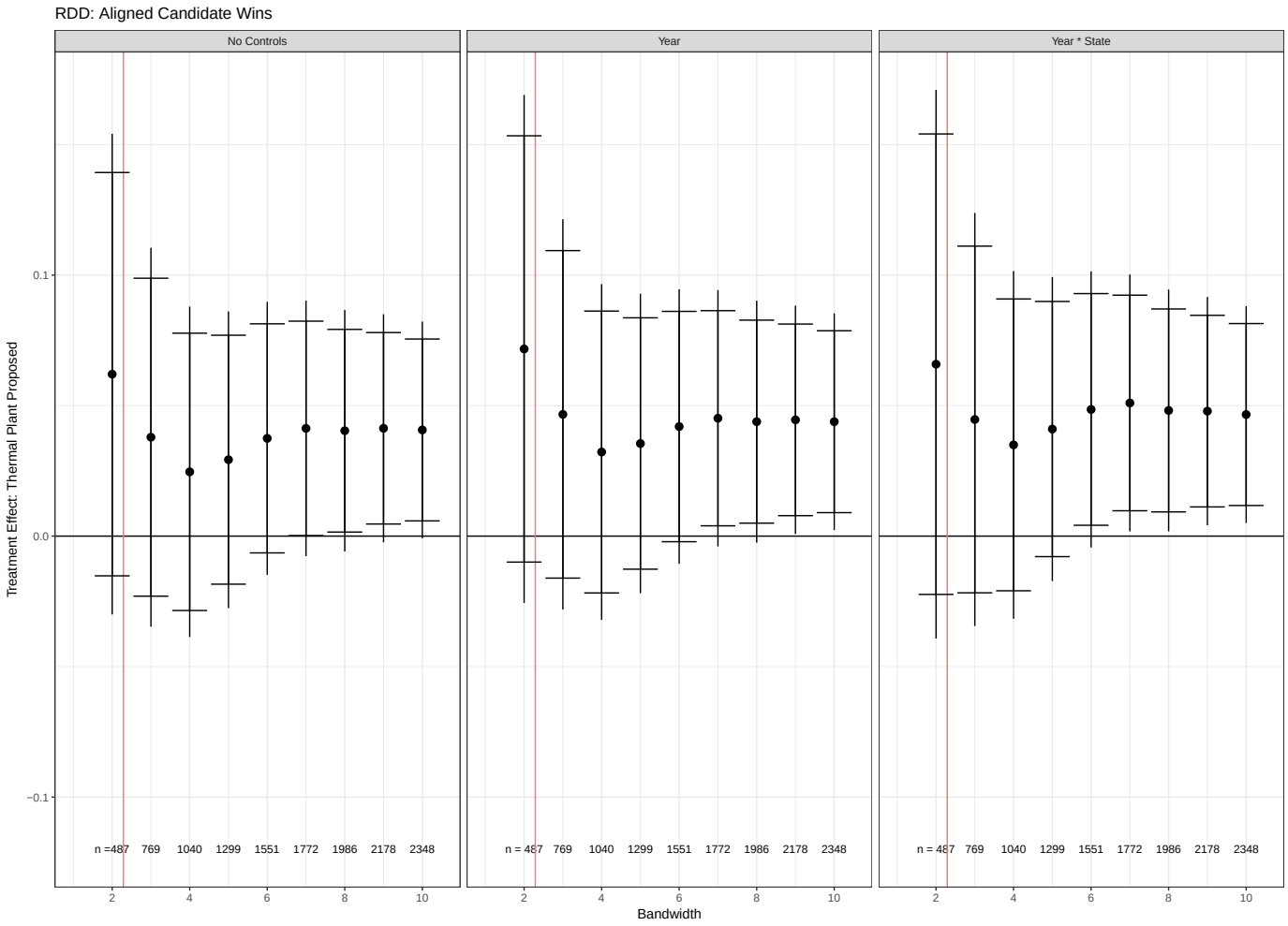

Figure A2: Alignment: RD Estimates Dropping Data at Cutoff ("donut" dataset).

A3 Additional Analysis

In this section we report point estimates from a subset of the RD analyses conducted in Figure 2 of the main text. Table A4 presents RD estimates at three different bandwidths (1, 2.5, and 5 percentage points), with and without year and state fixed effects, for the alignment treatment.

	Margin $< 1\%$			Margin $< 2.5\%$			Margin $< 5\%$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Aligned (=1)	0.018	0.022	0.045**	0.027	0.033	0.04	0.024	0.03	0.037*
	(0.015)	(0.017)	(0.022)	(0.021)	(0.023)	(0.026)	(0.021)	(0.021)	(0.022)
N	292	292	292	712	712	712	1377	1377	1377
Year FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
State FE	No	No	Yes	No	No	Yes	No	No	Yes
						Note:	*p<0.1; **p<0.05; ***p<0.01		

Table A4: RD Estimates - Aligned Treatment.

A3.1 Heterogeneous Treatment Effects

Candidates for office in Indian state legislatures are elected by plurality in multi-party contests. As a result, the "cutoff" point for treatment to be administered varies in terms of candidate vote share. To normalize the sample, we define the running variable as the margin of victory or loss of a treated candidate with a cutoff of 0. However, the differing electoral circumstances that lead to a narrow victory with 25% of the vote versus 50% of the vote may produce differing treatment effects as well (Cattaneo et al., 2016).

In Figure A3, we test for heterogeneity in the alignment treatment by subsetting the sample according to the vote share of the treated candidate's strongest opponent (the "cutoff" in terms of vote share rather than margin). The bandwidth is set at 10 percentage points in order to increase power, and the sample is divided into quartiles. The notches at the base of the graph indicate the density of the sample at those points: the distribution of cutoffs is relatively normal and there is good coverage across the space. While the point estimates vary across quartiles, they do not suggest systematic differences in treatment effect.

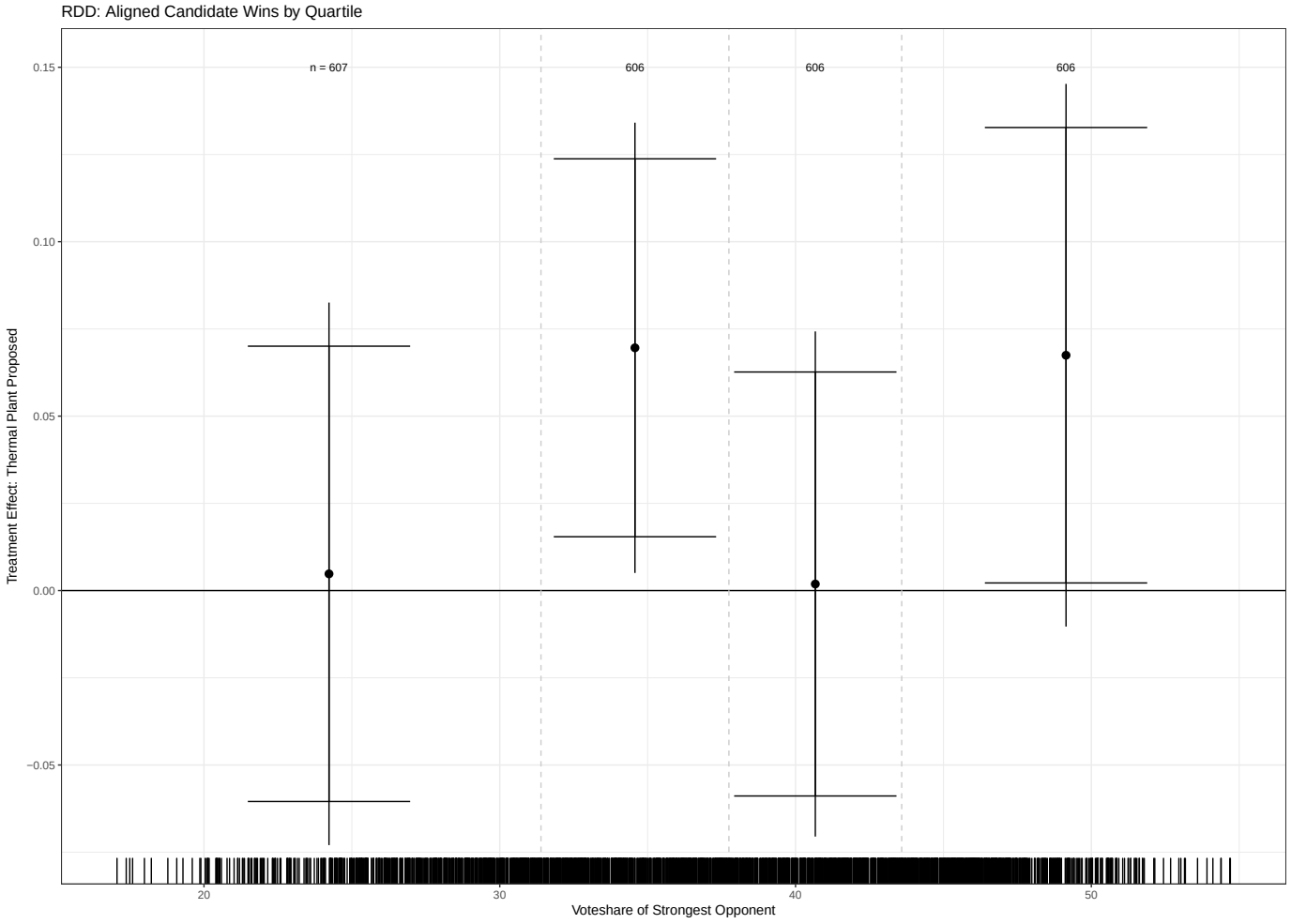

Figure A3: Alignment: RD Estimates for Different Cutoff Ranges.

A3.2 Capacity of Proposed Plants

In this section we explore whether effects can be differentiated based on the capacity of plants proposed. Figure A4 plots the distribution of coal and natural gas plants based on size – though coal plants skew larger, on average, the total range of sizes is comparable across fuel types and the largest plant proposed used natural gas.

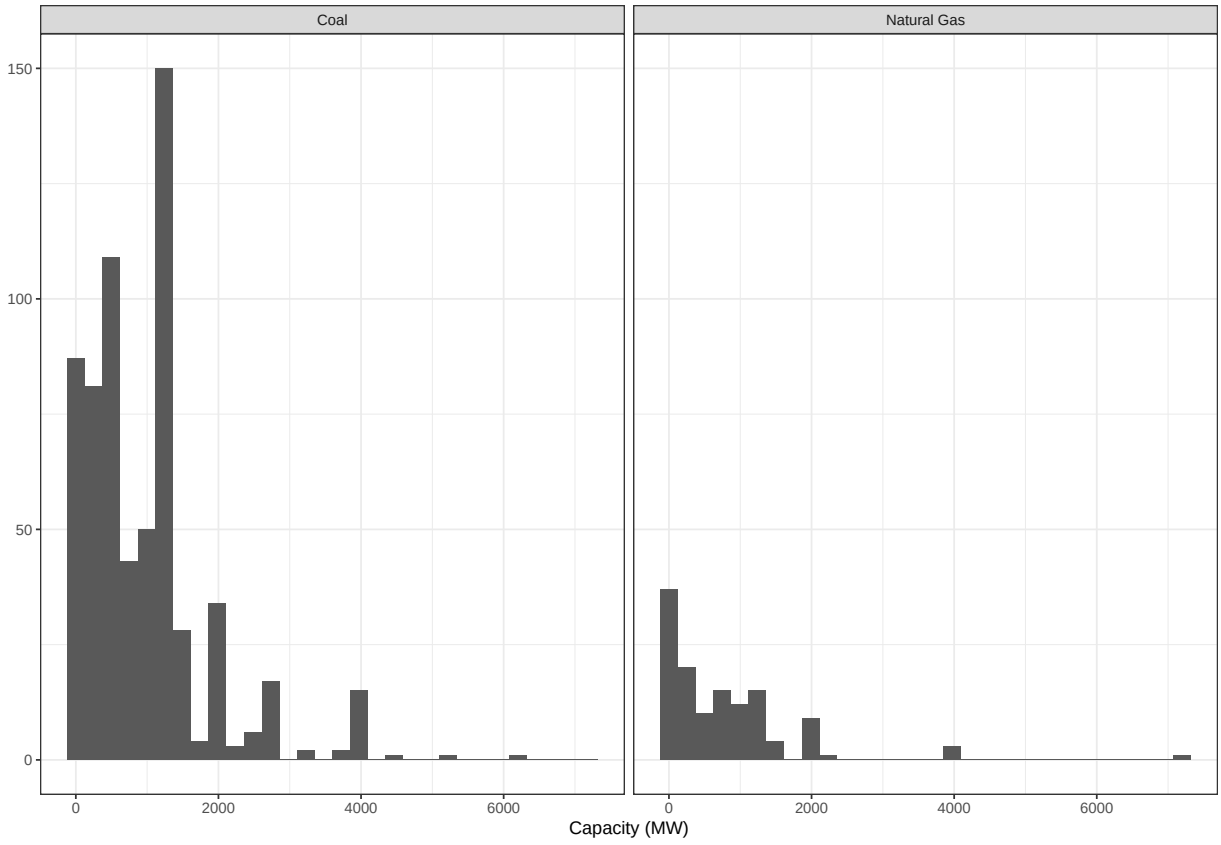

Figure A4: Alignment: RD Estimates for Different Cutoff Ranges.

In Figure A5, we explore whether treatment effects varied based on the capacity of plants proposed. The top panel shows RDD effects using *large* plant proposals ($\geq$ 1000 MW capacity) as the outcome. The bottom panel shows the effects using only small plant proposals ($<$ 1000 MW). Effects are substantively larger for the largest plants, particularly at higher bandwidths, suggesting that these supersize plants may be a key component in our main results.

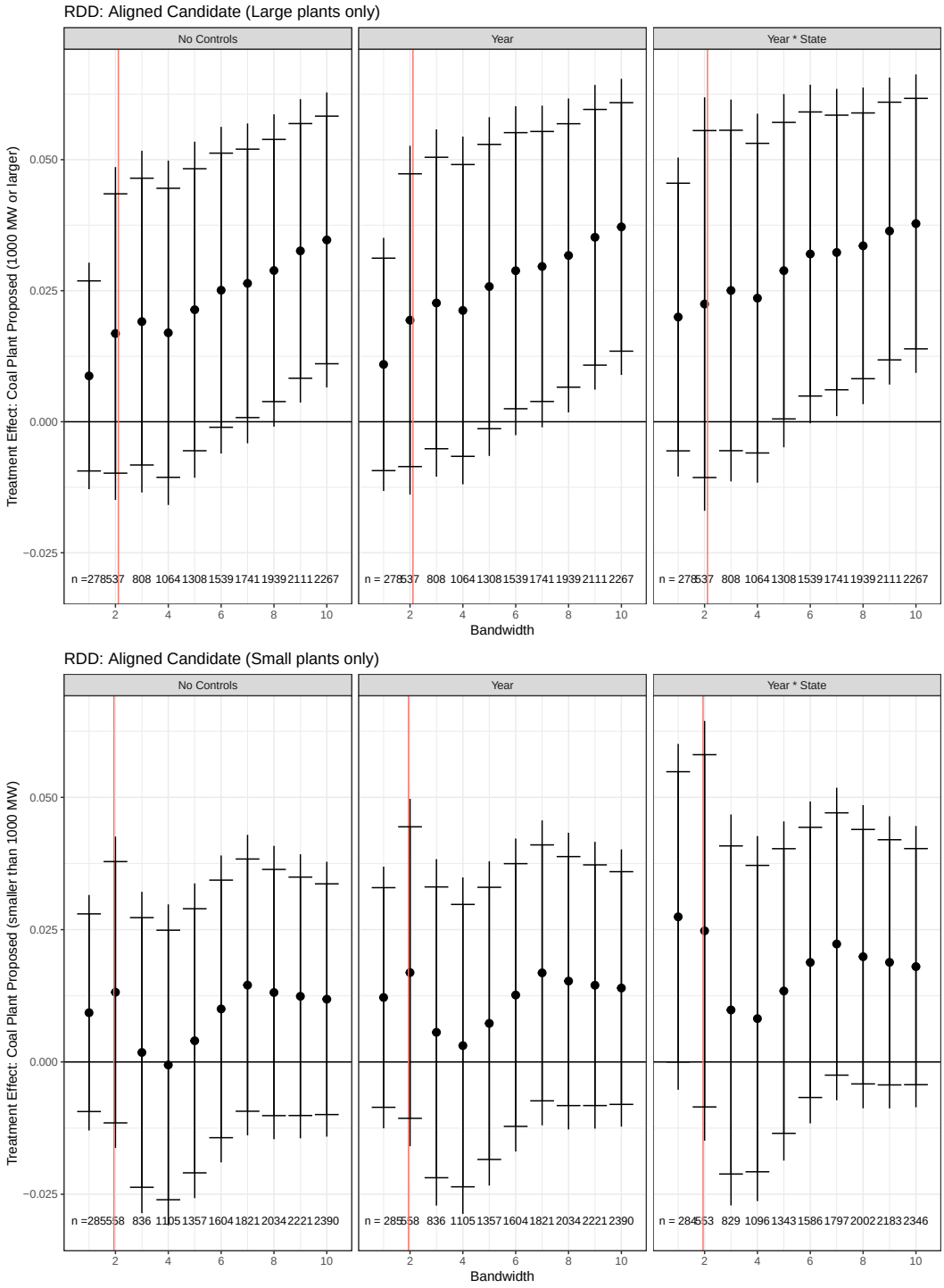

Figure A5: Alignment: RD Estimates – Plant Size.

Supplementary Appendix: References

Cattaneo, Matias D, Rocío Titiunik, Gonzalo Vazquez-Bare, and Luke Keele. 2016. "Interpreting regression discontinuity designs with multiple cutoffs." *The Journal of Politics* 78 (4): 1229–1248.

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