Bureaucratic Learning and Environmental Clearances in India*

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Abstract

The time taken to get regulatory approval is a crucial factor for firms that incur significant financial costs when their projects are held up due to a lack of state approvals. Why does the state delay granting environmental clearances in some cases but not others? In this paper, we use the universe of projects seeking environmental clearances from state governments in India between 2017 and 2023 to show that bureaucratic learning plays a central role in delays in environmental clearances. We show that expert committees appointed to grant environmental clearances based on technical assessment of projects take longer to grant clearances in the first year of their appointment. The time to get approval reduces substantially in the second and third years of the committee's three-year tenure. We attribute this bureaucratic tenure cycle to learning effects where the committee members use informal norms to improve coordination. To understand the impact of learning effects on the quality of regulation, we look at how changes in the political environment impact the time taken to grant approvals. The paper demonstrates that bureaucratic processes in environmental regulation that are highly rule-bound are shaped by learning informal norms.

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Introduction

Governments worldwide are striving to fulfill the 17 Sustainable Development Goals (SDGs) by the target year of 2030. This demands balancing two seemingly contradictory objectives: inducing new economic growth while ensuring environmental preservation. The government's success in this endeavor largely hinges on the quality of environmental regulation. The timely issuance of regulatory approvals and adherence to prescribed processes facilitate ease of doing business by providing a stable investment environment and streamlining costs. However, regulatory delays and backlogs in processing approvals curtail economic activity and cause significant economic losses. For instance, large-scale industrial or mining projects, seen as crucial for spurring economic activity, are often stalled due to lack of environmental clearance. Conversely, environmental preservation necessitates rigorous scrutiny of projects, comprehensive impact assessments, and extensive monitoring to ensure compliance with various conditions. Oversights in these processes can result in severe environmental damage. For instance, projects in eco-sensitive forest zones disrupt flora and fauna and cause extensive damage to the ecosystem, or rampant mining can pollute groundwater. Thus, regulatory scrutiny that is based on well-defined rules remains crucial for achieving sustainable development.

Globally, states create entry barriers, such as mandatory regulatory approvals for projects that can potentially degrade the environment. For example, industrial projects, infrastructure development, and mining of minerals are often subject to environmental regulation. The regulation takes the form of rules, laws, and technical assessments to maintain standards that ensure that economic activity does not have negative spillovers on the environment. Therefore, firms are mandated to obtain permits or environmental clearances before initiating economic activity. These environmental clearances are granted on the basis of the recommendations made by a body of technical experts who use their expertise to assess the ecological impact and balance the competing interests of propelling economic growth and safeguarding the environment. The regulatory state, like other bureaucracies, follows well-defined procedures that aim to ensure that firms seeking approval can expect time-bound response (Carpenter and Moss 2013; Glaeser and Shleifer 2003).

Even though the state puts in place clear guidelines for getting environmental clearances, the time taken to get approval varies substantially across projects. The time taken to get approval is crucial for firms since existing and future investments of firms are heavily contingent on regulatory approvals. Why does the state delay granting environmental clearances in some cases but not others? We answer this question using a newly assembled dataset comprising more than 60,000 projects seeking Environmental Clearance permits from state-level regulatory authorities across 16 states in India between 2017 and 2023. This granular dataset, which details the entire regulatory approval process for every application, allows us to empirically examine determinants of delay in getting environmental clearance from the state. We find tenure cycles in regulatory efficiency, where regulatory authorities consistently improve their processing times over the course of their fixed tenure. Specifically, committees entrusted with granting environmental clearances take progressively less time to issue as their tenure progresses. On average, the time taken to process applications, from submission of application to issuance of a permit, decreases from 155 days for projects submitted during the first year of a committee's tenure to 114 days in the last year of their three-year term [1].

We observe gains in time taken to grant environmental clearances over the tenure of the committee for all kinds of projects—industrial activity, infrastructure development and construction, and non-coal mining. What explains the reduction in processing time over the course of a committee's tenure? We attribute these results to institutional learning, wherein committee members improve within-group coordination and learn and develop informal norms of decision-making over time. The learning effects streamline the decision-making process and allow the committee to reach a consensus in a shorter time. Additional findings align with the institutional learning process. For example, we find that the learning effect is contingent on the size of the committee; the reduction in time taken to grant environment clearance across the tenure is weaker in the case of relatively larger committees.

Do these gains come at the cost of regulatory quality? We find tentative evidence to suggest that gains from institutional learning are not solely due to better coordination within the committee. The technical committee is not insulated from political influence on the regulatory process. This hinders institutional learning by increasing the complexity of the institutional environment (Levitt and March 1988). We demonstrate this empirically in two ways. First, we find that the decline in processing times over time is weaker in the case of projects located in areas aligned with the incumbent state government. This is because local legislators can exercise influence in the process due to political affinity and operate in a way that is akin to that of a 'veto player' (Tsebelis 2000). We also find that institutional learning is relatively weaker in cases where a government changes during the committee's term. A new government is likely to introduce new informal norms in the decision-making process.

Finally, we find that the level of scrutiny also declines over time during a committee's fixed

[1] This change is for median value of time taken and is an average gain of 26.5% over the committee's tenure

tenure. For a comprehensive analysis of changes in scrutiny, we will be assessing whether committees are more likely to impose strict compliance conditions on the issuance of an EC during the initial period of their tenure. However, this evidence suggests that institutional learning could be accompanied with decline in technical scrutiny and, therefore, potentially counter balance the gains in or worsen regulatory quality over time.

The paper makes an important contribution to the literature on the political economy of the regulatory state. First, we explain variation in bureaucratic coordination, which is often integral to the regulatory process. Specifically, we operationalize bureaucratic coordination through the tenure duration of the committee; the longer members serve on a committee, the greater their coordination. While scholars have extensively examined political and electoral determinants of regulatory quality, there has been limited exploration of the role of the appointed bureaucracy in shaping the regulatory processes. Research on regulatory processes in developing countries focuses on the political capture of regulatory bureaucracies by special interests and the electoral determinants of regulatory quality. Most of the literature on bureaucratic determinants of regulatory responsiveness emerges from the Western context (Dal Bó 2006; Carpenter and Moss 2013; Rose-Ackerman and Rose-Ackerman 1995). This paper, therefore, fills this gap in the literature and adds to our understanding of the regulatory state in developing democracies.

Second, we also contribute to the literature on the politics of climate change mitigation and sustainable development (Ferraz 2007; Kopas et al. 2022). India, like other rapidly growing countries with a large share of its population living in poverty, faces the dual challenges of fostering economic growth while mitigating the impact of climate change and the steady depletion of natural resources. The dual imperatives of maintaining economic growth while preserving the environment are most acutely felt in India. Therefore, it is crucial to understand the determinants of environmental regulation by opening up the black box of regulatory structures. By focusing on institutional learning, we show that understanding the internal dynamics of the regulatory state is crucial for improving the quality of environmental regulation.

The rest of the paper proceeds as follows. First, we outline the context in which we situate our discussion by describing the framework of environmental regulation in India. This section describes the range of commercial activities and jurisdiction of state-level environmental regulatory authorities in India. Second, we present a theoretical framework for understanding why committee tenure should determine time taken to grant environmental clearance. Third, we discuss our data and identification strategy for empirically testing our theoretical expectations and ruling out rival explanations. Fourth, we present our main findings alongside preliminary robustness checks. We conclude the paper by summarizing the implications of the results and discussing ongoing analysis.

Background and Context

The existing framework and institutional structure guiding the regulation of economic activities that impact the environment in India can be traced to the National Environment Policy of 2006. The rules framed by the central government in the Environmental Impact Assessment (EIA) Notification issued on 14 September, 2006 under the Environment (Protection) Act, 1986, outline the process for obtaining Environmental Clearances (ECs) for commercial activities (See Link). The framework clearly identifies the jurisdiction of federal and state-level regulatory authorities for the issuance of environmental clearances and outlines the regulatory structure in detail.

The jurisdiction of the federal and state-level regulatory authorities depends upon the scale and potential downstream impact of the project. For instance, projects with significant environmental implications, such as large coal mines or mines that cover more than 50 hectares, require federal approval. Based on well-defined criteria, projects are categorized into two lists (or schedules)—Category A (Federal) and Category B (State-level). Category A projects are evaluated by the Ministry of Environment, Forest and Climate Change (MoEFCC) and the Expert Appraisal Committee. On the other hand, Category B projects are evaluated by the State Environment Impact Assessment Authority (SEIAA), which acts on the recommendations of the State Expert Appraisal Committee or the SEAC (Ghosh 2013). In this paper, we focus on the state-level environment regulators across 16 major states of India.

Regulatory Structure

The State Environmental Impact Assessment Authority (SEIAA) is the principal decision-making authority for all Category B projects. The SEIAA includes three members: the Chairman, the Member, and the Member Secretary, nominated by the state or the federal government. The member secretary is usually a serving state-level bureaucrat, while other members can be technocrats who fulfill the pre-designated eligibility conditions. The task of monitoring compliance with regulations is inherently technical and requires a comprehensive understanding of various aspects of the projects. The SEIAA acts on the basis of technical recommendations and expertise provided by the State Expert Appraisal Committee (SEAC). The SEAC is an expert committee whose main role is to evaluate the project based on the mandatory Environmental Impact Assessment (EIA) reports and submit their recommendations on the application to the SEIAA.

The overall process for obtaining ECs can be broadly divided into four stages - screening, scoping, public consultations, and appraisal. The screening step often involves the SEAC scrutinizing the project details to assess the need for an Environment Impact Assessment (EIA). The EIA, mandatory for projects classified as B1 and conditionally required for B2 projects based on the SEAC's assessment, is a detailed examination of the project's environmental impact prepared by a government-accredited private agency on behalf of the project proponent. The EIA includes a technical assessment of the ecological impact of the project, including its impact on air, water, and soil quality on-site and in the surrounding area. The scoping activity requires defining clear Terms of Reference (ToR) to lay out the potential impact on the environment. Moreover, public consultations require advising the communities that are impacted by the project (Ghosh 2013). Often, other agencies like the State Pollution Control Boards are also engaged in the consultation process. At the final stage of the appraisal process, the SEAC undertakes a detailed scrutiny of all documents submitted by the proponent and evaluates the proposal. Finally, the SEIAA acts on the recommendations of the SEAC and takes a final decision on the issuance of an EC. In certain cases, firms can be asked to submit an Environment Management Plan detailing mitigation strategies for the adverse impact of the project. In many cases, project proponents fail to fulfill the additional documentation requirements within a stipulated time and their projects are delisted from the process rather than being outrightly rejected.

Composition of State Expert Appraisal Committee (SEACs)

The State Expert Appraisal Committee (SEAC), a critical body in India's environmental clearance framework, is tasked with reviewing the environmental impact of proposed projects. The SEAC can comprise up to fifteen members, though the actual size varies considerably across states, ranging from five to fifteen during the period under study. The composition of the SEAC is intended to include experts and professionals with relevant qualifications and prior experience, as specified in the EIA notification of 2006. The SEACs are appointed by the Ministry of Environment, Forest, and Climate Change (MoEFCC) in consultation with the respective state government for a fixed tenure of three years. The appointment process involves multiple stages: the state government invites applications for nomination to the committee and recommends selected individuals to the MoEFCC for final approval. However, the MoEFCC is not bound by the recommendations of state governments and retains the authority to reject nominees if they fail to fulfill the eligibility criteria. In some cases, the MoEFCC, in concurrence with the state government, appoints multiple SEACs within a state for administrative convenience. When multiple committees are appointed, each is assigned a jurisdiction based on districts to ensure efficient processing of applications.

While SEAC does not have regulatory authority to accept or reject a proposal, it plays an important role in shaping the final decision by the SEIAA. The SEAC scrutinizes the EIA, verifies the claims made by the proponents through field visits, and ensures procedural fidelity. For example, for B1 projects that are required to hold public consultations, SEAC can often visit the site to assess the situation or directly understand the opinion of local stakeholders. As these steps demonstrate, the issuance of ECs often involves a back-and-forth between the project proponent and the two key state-level bodies engaged in the regulatory process. This includes addressing technical queries by experts prior to making a final decision. The requirements, while intending to institute protocols that seek to balance the competing interests, also give the regulatory authority considerable discretion in approving or rejecting the proposal.

This discretion is central to the political economy of environmental regulation in India. While firms have recourse to courts and may appeal the decision of the state regulator, this is rarely a feasible option due to the high costs and delays associated with legal procedures. Further, beyond the binary of approval and rejection, the regulator can delay the process at various steps or approve with mandatory conditions or changes in project conditions. Despite the limited capacity to monitor project activities and compliance post-approval, issuance of a clearance remains a crucial hurdle for firms and individuals seeking to initiate new economic activity. The projects often provide large economic gains and also require substantial fixed costs. Thus, the time taken to get approval has a crucial bearing on the firms.

Environmental Clearances for New Economic Activity

As mentioned above, in India, environmental clearance is required for a wide range of commercial activities.[2] These economic activities are broadly placed into three categories—Non-Coal Mining, Industrial projects, and Infrastructure development.

Among these three groups, the highest number of applications and clearances granted are for non-coal mining projects. This includes the extraction of minor minerals such as quartz, sand, stone chips, etc., which are essential for downstream economic activity, generating local employment, and providing states with valuable revenue. These non-coal mining projects generate economic activity in mostly rural areas and provide valuable mining revenue to the state (especially valuable to states that lags behind in industrial activity and infrastructural development). Apart from non-coal

[2] The EIA Notification 2006 lists all activities under regulation.

mining, the state regulators also review industrial and infrastructure projects. Industrial projects include a wide range of industries, from manufacturing pharmaceutical products to fertilizers, that could adversely impact the environment. A large number of infrastructure projects under the jurisdiction of state environment regulators are commercial and housing real-estate developments.

Figure 1: Non-Coal Mining Activity

The figure shows a non-coal mining quarry in the state of Kerala

Theory

Regulatory bodies across the globe use a legal and technical framework to adjudicate whether a proposed economic activity would have an adverse impact on the environment. Ensuring compliance with environmental standards requires creating institutional structures that ensure fidelity to the rules and frameworks. States often rely on expert committees to ensure that technical criteria and legal frameworks regulating environmental activity are adhered to in an impartial manner. Expert committees often have requirements in the form of educational expertise and clearly defined term limits to make sure that decision-making is autonomous and meets environmental standards. For example, regulating economic activity that could cause air pollution requires understanding the latest research on the negative health externalities of particulate emission. Along with understanding technical standards, the committee also needs to be cognizant of the economic, environmental, and legal consequences of approving a project. Thus, committees are often made up of diverse sets of members from different fields like academia, industry, and non-governmental organizations (NGOs).

As the previous section has described, in India, at the sub-national level, SEAC is responsible for ensuring that projects granted environmental clearances adhere to technical and bureaucratic processes. SEAC is a committee of experts and, it takes decisions to grant environmental clearances as a collective unit. In this section, we outline a theoretical framework to understand the functioning of regulatory agencies like SEAC that operate as an exert committee group. Such groups are common across different regulatory institutions (For example, pollution control board) and are responsible for approving projects with substantial impact on the environment and economic growth. We develop a framework that theorizes the functioning of expert committees by juxtaposing two characterizations of the regulatory state. We begin by putting forth the "Weberian" ideal of bureaucratic autonomy, where the regulator is insulated from the pressures of political actors and special interests and strictly adheres to rules and procedures. We use a queuing model to describe a politically independent and neutral regulatory state. We then discuss the "Captured" state is beholden to special interest and maximizes the rents for groups that control its working to create a system of spoils.

Finally, we propose our theory of a "Drifted" regulatory state whose decision-making is contingent on institutional learning and shaped by the incentives of interest groups and politicians. The "Drifted" regulatory state examines how individuals and groups with limited information and bounded rationality carry out the task of regulation; in this case the task of granting environmental approvals. Expert committees we argue learn about each other and informal norms that allow them to coordinate among each other and come to consensus. We differentiate the drifted regulatory state from a captured regulatory state that is beholden to special interest with no autonomy. Thus, we theorize regulatory processes in the developing world through the lens of hybridity, where the dynamics of a bureaucratic committee have a substantial impact on the responsiveness of the state towards firms seeking environmental clearances but are neither autonomous nor captured.

Scenario 1: The "Weberian" Regulatory State

The "Weberian" Regulator State can be imagined as a rule-based decision maker that grants environmental clearances based on technical guidelines and in adherence to a legal framework. In this ideal scenario, the expert committee, which forms the heart of the regulatory state, would grant environmental approvals based on deliberations that would be shaped by technical inputs provided by the applicants and the technical guidelines. Across the globe, consultants and agencies submitting applications for environmental clearance rely on subject matter experts who, in turn, justify projects based on existing rule-based frameworks. For example, the mining of minerals requires being aware of the ecology of regions and assessing whether the costs of degrading the environment outweigh the benefits from the downstream economic gains. The details necessary for coming to a technically informed decision are available to the committee. For example, a systematic reading of the decisions taken by the regulator shows that SEIAA, on the recommendation of SEAC, regularly rejects sand mining projects where the proposed rate of extraction is higher than the replenishment rate. The replenishment rate of sand is assessed based on technical details provided in the environmental impact assessment report. Another example of technically guided decisions is the conditional approval of industrial or infrastructure projects in ecologically sensitive areas or near animal sanctuaries, which attract greater scrutiny.

The idea of a rule-based regulator has two essential features a) the regulator is autonomous and insulated from outside pressure from special interest groups or politicians b) the regulator strictly adheres to the rules and regulations. To provide a framework for understanding how a Weberian regulator may operate, we model the regulatory approval process using queuing theory. In the queuing model, clients seeking approval line up in front of an office that processes their requests on a first-come, first-serve basis. This basic model provides us with some predictions for the relationship between the volume of project applications, regulatory capacity, and time taken to process applications [3].

Every queuing model is characterized by the following parameters - the **arrival process**, the **service time**, and the **queue length**. The **arrival process** describes the process by which customers or firms submit their proposals to the SEIAA . The arrival process is characterized by the arrival rate, or the time between the arrival of one customer and another (), and is assumed to follow a particular probability distribution. In the case of a simple M/M/1 [4] queue, we can assume that the inter-arrival time (t) between applicants follows a Poisson distribution with parameter (λ) and takes the functional form $f(t) = \lambda \exp^{-\lambda * t}$. Thus, if more projects are submitted to the SEAC, the value of λ goes up, reducing the inter-arrival rate $\frac{1}{\lambda}$.

The **service time** (μ) is defined as the time taken to serve an application and also assumed to have a pre-defined probability distribution. In the case of the M/M/1 queue we assume that the service time (s) follows an exponential distribution characterised by a rate parameter μ i.e $g(s) = \mu \exp^{-\mu * t}$ In the case of a M/M/1 Queue model there is a single window that serves customers one at a time and dispenses one application in an average time of μ.

As is intuitive, how long firms end up waiting depends on how fast people queue up (linked to λ) and how quickly the single window can dispense applications. The most fundamental result for

[3] We borrow terminology from research in telecommunications, where queuing models are used to understand the most efficient way for transferring information across a network (Giambene 2014). Queuing models have also been widely applied in fields like public health and operations research where customers seek critical services from institutions with limited capacity and resources (Fomundam and Herrmann 2007; Meisling 1958).

[4] The shorthand notation for describing any queue takes the generic format of A/S/c, where A refers to inter-arrival time distribution, S is the service-time distribution, and c is the number of servers. M/M/1 suggests that the inter-arrival and service-time distributions are Markovian and that there is one server. Refer to Kendall's Notation for more details

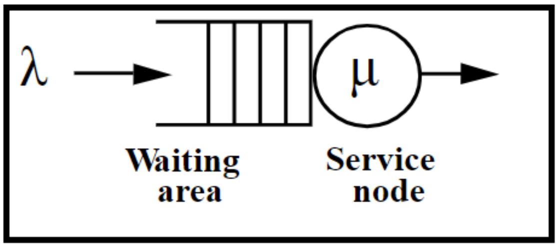

Figure 2: M/M/1 Queue

a queuing model is the Little's Law, which states that

$$W = \frac{1}{\mu - \lambda} \tag{1}$$

where

- W is the waiting time a claimant spends in a queuing system,
- μ is the average service rate,
- λ as stated before is the arrival rate or the average number of items arriving at the system per unit of time.

These results suggest that if firms queue up at a faster rate (goes up) or the single window slows down how quickly applications are processed (goes down), we should expect longer lines and an increase in the average waiting time experienced by applications. These results allow us to come up with observable implications for the relationship between application volume, approval rate, and time taken to approve projects. The increase in the arrival rate of claimants increases the waiting time for each firm due to the formation of a longer queue. The queue length (Q) captures the idea of accumulating backlog when the number of applications arriving increases since, in a Weberian state, there is no queue jumping. As existing research suggests, regulators in low and middle-income countries are resource and time-constrained, and therefore, additional task burden due to a greater **arrival rate** λ is likely to have a negative impact on responsiveness. We should see an increase in the time it takes on average to get applications processed (W goes up) when more applicants queue up. Correspondingly, if there is no change in the quantum of applications, we should not see any change in the approval rate or time taken to approve.

Under the Weberian ideal type, where projects are subjected to an impartial review based on clearly defined criteria, the inverse relationship between application load, state capacity, and state responsiveness, the model suggests

Hypothesis 1 (H1) *The time taken to process the applications and will remain the same as long as the number of projects submitted do not constraint the capacity.*

Scenario 2: The Captured Regulatory State

Scenario 3: The Drifted Regulatory State

As an alternative to the Weberian regulatory state, we proposed the drifted regulatory state. Such regulatory authorities have limited misalignment with the intended regulatory goals. They deviate from complete adherence due to political or elite influence. Under such scenarios, the regulatory process involves both adherence to official protocol and informal norms for coordination and decision-making. Institutional learning in case of drifted regulators entails both official procedures and coordination on norms and heuristics.

The idea of the learning process borrows from a rich literature in political science and organizational studies that shows that in a group setting there is an overtime learning which impacts decision-making (Carpenter 2002; Levitt and March 1988). Regulatory agencies are groups of experts who are appointed to a fixed tenure. These groups require consensus in order to finalize the decision to approve an environmental clearance. The EIA 2006 notification makes this explicit: "*The EAC and SEACs shall function of the principle of collective responsibility. The chairperson shall endeavor to reach a consensus in each case, as if consensus cannot be reached the view of the majority shall pervail*". The SEAC therefore strives to reach a consensus which requires finding a balance between adhering to technical criteria and playing along with the group rules. The discussions of the group are also released to the public in the form of meeting minutes. Under such circumstances, in the face of high-stakes projects, the group is likely to develop shared norms that help come to a consensus faster.

Hypothesis 2 (H2) *If the regulatory agencies learn over time, we should see a consistent decline in processing time, holding other factors constant.*

Rent-Seeking Incentives

In developing countries, the idea of regulatory capture is closely associated with the control of state institutions by incumbent political parties (Bardhan and Mookherjee 2000; Min and Golden 2014). The considerable discretion exercised by the regulatory bodies creates opportunities for rent-seeking since technical regulations can be used to delay project approval or strategically reject applicants who do not pay rent. How does institutional learning occur in case of regulatory capture?. We do not suggest that learning is incompatible with political capture.

Corruption in regulatory approval is often linked to the patronage networks of incumbent politicians. Political parties in power are, therefore, likely to prioritize projects that align with local political networks. Members of the Legislative Assembly (MLAs) are seen as power brokers in local parties and often are deeply enmeshed in the patronage networks linked to rents (Asher and Novosad 2016). Thus, if the environmental regulator is developing norms for achieving internal consensus, the presence of veto players like MLAs should make it harder to reach consensus. The patronage networks of the incumbent government, therefore, limit the learning. More importantly, any change in the external environment that disrupts the group dynamic is likely to slow learning. One testable implications emerge from this discussion.

Hypothesis 3 (H3) *This learning advantage should be highest when there are no veto players.*

Data and Methodology

Studying regulatory bureaucracies in developing countries is a challenge due to the lack of data on their decision-making process. The environmental regulators provide detailed information regarding the regulatory norms, but quantitative data on decision-making is often harder to find. We circumvent this challenge by using information from the official portal of state-level environmental regulatory authorities. Each state regulator in India started to publish detailed information regarding the applications for environmental clearances along with the outcome of the process and the different deliberative steps involved in the decision-making process. Using this information, we construct a micro-level dataset of all applications for environmental clearances submitted to 16 Indian states between 2017-2023. Our dataset includes information such as applicant details, location, project description, and detailed timeline of the regulatory process.

In this section, we describe the main dataset used for the analysis and the identification strategy for establishing the existence of tenure cycles in the rate of project approval. The next section presents both aggregate descriptive statistics along with the spatial distribution of the projects after describing the individual project-level data.

Data

The project-level dataset captures the information submitted by applicants seeking environmental clearances for the state regulator. The applications follow a standard format and, once submitted to the state environment regulator, go through a process of review. As mentioned earlier, the back and forth between the state regulator and the applicant is not uncommon, and applications can be augmented with greater details. The individual-level data contains the following information:

- **Dates:** The date of application submission is available for all applications. In addition, we have also collected the date of approval for projects that were eventually granted ECs. If the project was not approved (either rejected or delisted), the approval date is not always mentioned. It can be manually retrieved by reading the documents, but for this version of the paper, we only have an approval date for projects that were granted an environmental clearance.
- **Location:** We have the state, district, and sub-district locations for all the applications. The accuracy of the location information varies across projects. In close to 60% of the projects, we have the exact latitude and longitude of the project. In the rest of the cases, we have approximate information based on matching the name of the sub-district with the centroid of the polygon in census files.
- **Description of the project:** This field broadly describes the purpose for which the environmental clearance is being sought. The details mentioned in the project vary but often have enough information to subcategories the nature of the non-coal mining projects. For example, we use the mention of sand mining to distinguish between the project that aims to extract sand and other projects.
- **Firm Information:** We also collect some information about the applicant, including their name and address.
- **Sub-Category of the project:** The state environment regulator can only review projects placed in Category 'B' as per the 2006 law enacted by the federal government. At the same time, projects in category 'B' are further subdivided into B1 and B2. While B1 projects are mandated to carry out an environmental impact assessment and hold public consultations, these steps are not binding on projects placed in the B2 category. We capture this subcategory of the project.

As Table 1 shows we have close to 60,000 applications submitted across 16 large states[5] from 2017 to 2023. The average approval rate of over 60%, and the average days taken for an application to be approved is $\tilde{1}75$ days. As the Table shows, the days for approval are only available for applications that are granted environmental clearance. Finally, close to 11 % of projects fall under the B1 category, 26 % of projects are for sand mining, and close to 60 % of projects are from aligned political constituencies.

Spatial Mapping

The availability of information on the location allows us to geocode each project. We use the coordinates to then assign background and political characteristics to every project. For background characteristics, we use geospatial techniques in R to map the coordinates to sub-district polygons, which can then be linked to census and other secondary data (like Economic Census). We follow a similar process to determine the political alignment of each project. First, we use the locations to assign the projects to specific constituency polygons. Then we use the specific date of submission to map on the assembly to a political party that won the constituency in the closest previous election. Finally, using a data on incumbency (along with coalitions) we assign the MLA the status on having been aligned with the party with power or not. Since the variable is linked to the date of project submission, it is time-varying. Further, we have taken care to account for a few cases where the government in power was changed in the middle of its tenure. Figure 3 maps the non-coal mining projects across the entire period (2017-2023) to the sub-districts and divides them into 10 quantiles at the state level. We have similar maps for industrial and infrastructure projects.

Tenure Cycle of Committees

The paper focuses on the role of learning in the functioning of the expert committees. In order to examine the impact of the tenure of the committee on the time taken to grant environmental clearance, we collected data on all the committees at the state level from 2017 to 2023. We use the notifications to identify the start and end of every committee and divide the tenure in weeks; every committee that serves a 3-year period has 155 observations for its entire duration[6]. We aggregate the individual-level project data to create a measure at the week of committee week-state level for

[5] The states included in this analysis are Andhra Pradesh, Bihar, Chattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, and West Bengal

[6] Since there are $\tilde{5}2$ weeks per year

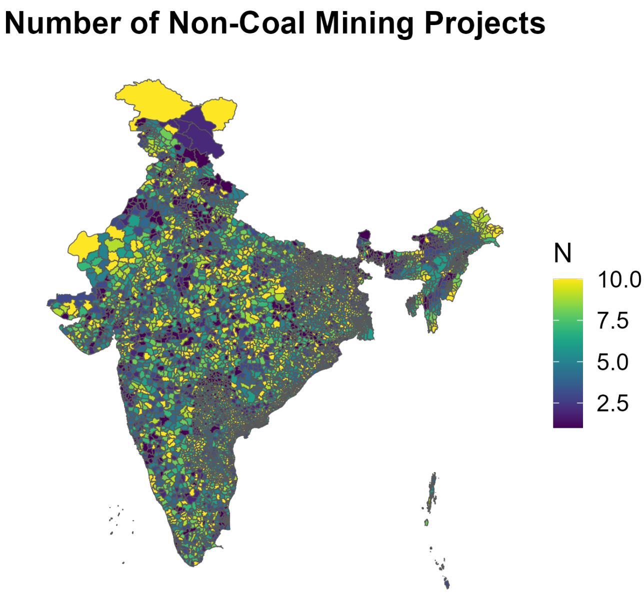

Figure 3: Spatial Distribution of Non-Coal Mining Projects

The map shows the spatial distribution of non-coal mining projects submitted for environmental clearances at the sub-district level. The projects are divided across 10 quantiles within every state.

the time taken to get a project approved. Using information, we measure if the temporal distance from the date of the committee constitution has any relationship with the time taken to approve an environmental clearance.

Table 2 summarises the variables in the tenure cycle. There are close to 22 projects submitted on an average number at the state-committee week level, though there is a large standard deviation, and the maximum number is as high as 218. The average number of projects granted licenses per state week is around 14. The percentage of projects granted approval is 60, with a large variance. Finally, the average time taken to grant approval is 211 days. The committee tenure week varies from 0 to 222 since some committees receive an extension till the appointment of new members (exceptional cases).

Identification Strategy

Tenure Cycle

We examine the relationship between the committee duration (measured in weeks), and the time taken to approve applications seeking environmental clearances. The two main dependent variables are time taken in days and time taken logged (since there is a large variation in time taken we log the variable to make sure results are not driven by outlying observations). We also control for the number of applications submitted, thereby controlling for the workload of the committee. To estimate the tenure cycle we use the following equation

$$Time_i = \alpha + \beta \text{Week}_i + \eta \text{Category}_i + \delta \text{Submit}_i + \tau \text{Region}_i + \theta \text{YearQuart}_i + \epsilon_i$$

Here, i represents project i submitted for approval. Submit_i captures the workload of SEAC i.e No. of projects transferred to SEAC alongside project i. Week_i is the running variable that captures the week in the SEAC's tenure when project i was transferred to it. Additionally, we add fixed effects for year-quarter, sub-region, and category of the project. The aims to capture the tenure cycle and is the main independent variable of interest. The staggered nature of committee formation allows us to rule out several confounding time-invariant confounding factors.

Project Type

We also examine if the cycle is driven by broader project categories. Projects submitted for environmental clearance broadly fall under three main categories - industrial, infrastructure, and non-coal mining. It is possible that results we see are driven by project categories. For example, certain projects that take longer for shorter time to adjudicate might be driving our results. Therefore we add δ_p as project type fixed effects.

Political Alignment

Along with the tenure cycle, we also examine the role of political environment. In order to add political covariates we create a separate dataset that captures political characteristics at the subnational level for the time period under consideration (2017 to 2023). In this dataset we add variables like change in government i.e if a new party came to power that was not the incumbent political party. We also use the spatial mapping to assign every project an alignment status - 1 if the project originates from the constituency of an MLA who is aligned with the government in power and 0 otherwise. We taken into account alignment between local politicians and the incumbent government and examine whether that alignment shapes the learning process.

Findings

Tenure Cycle Results

We examine if the tenure of the SEAC Committee is predictive of the time taken for granting environmental clearances (Table 3). In the models, the linear term τ is -ve and statistically significant in most of the specifications. We also run the same analysis with the dependent variable log transformation to ensure that the results are not sensitive to outliers (Table 4). The results remain similar in direction and statistical significance. These results align with the visual representation of the tenure cycle in the time taken to grant environmental clearances (See Figure 4 and Figure 5) and point towards learning effects. Given the decrease in τ represents a substantially faster response to applications as the tenure of the committee increases.

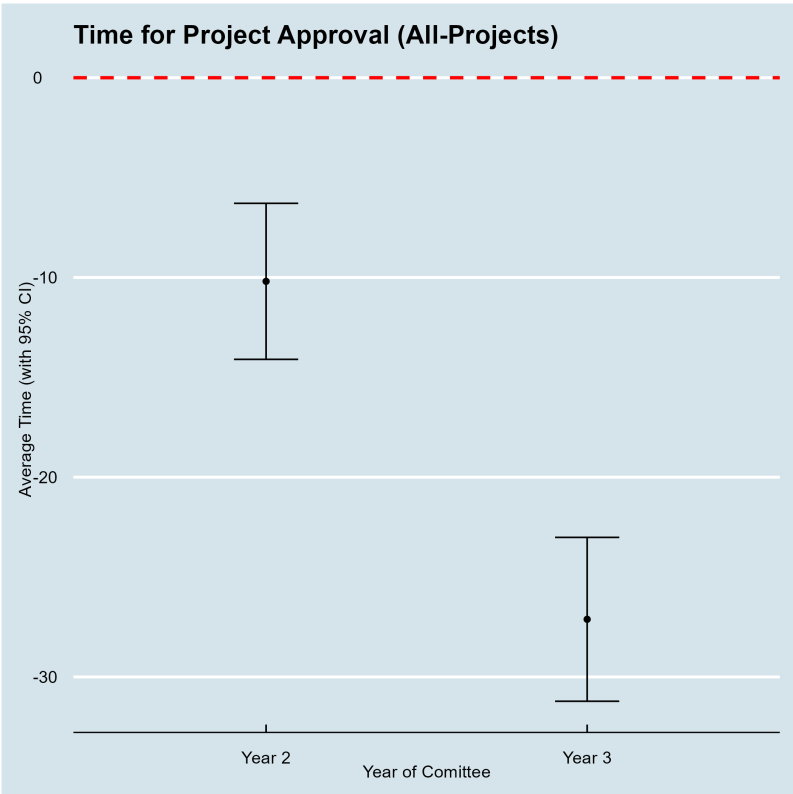

Figure 4: Time Taken for Approval Across Years of Committee

The results show the change in time taken for the state regulator to grant environmental clearances to projects across their tenure in years. Most regulatory agencies are constituted for a 3-year term, and in some exceptional cases, the term is extended by 1 year. The estimates of time taken for granting the clearance are with respect to the first year, which acts as a reference category. The point estimates show that there are large gains in terms of number of days take

Committee Size and Project Approval

We provide additional evidence to suggest that group learning is what is reducing the time taken to grant environment clearances over time. Learning through coordination and informal norms is likely to be shaped by the group size. Learning is a form of collective action where the group adjusts to each other and establishes routines that allow for more effective coordination. If that is true, we should see that learning differs by group size. We capture the size of the group and test if the learning effects captured by the reduction in time over the committee duration differ across groups. We find that larger groups indeed have more limited learning compared to smaller groups. We also check if committee size is determined by state characteristics (area, population, etc) and find that committee size is not determined by state characteristics. This gives us confidence that learning explains gains in time time taken to approve projects.

Mechanism

These results clearly indicate that the regulatory process is influenced by the duration for which the technical committee is constituted. Why does tenure reduce the time taken to process projects? What are the channels through which learning operates? Here, it would be important to distinguish between technical learning and learning that stems from informal norms or coordination that are embedded in the larger political context in which the committee operates. Technical learning suggests a process of familiarization with procedures and technicalities that allows individual members to operate more effectively with the passage of time. In such a scenario, the gains in processing time are a result of individual members learning about technical criteria and procedures. This type of learning is within the organization and is unlikely to be influenced by external factors. On the other hand, informal norms of coordination within groups can be thought of as shared understanding on being able to distinguish between projects and prioritize more important projects or sensitive projects in a manner that reduces conflict and facilitates early resolution. This section engages with evidence that examines if these learning effects are purely technical or whether they are based on informal norms. We also engage with the question of whether learning effects come at the expense of the quality of regulation.

To understand why committees are able to respond at a faster rate over time, we examined three sets of results. First, we look at whether committees that experience a change in government during their tenure differ in terms of their learnings. We do so by interacting our main independent variable - time since the formation of the committee - with a binary variable that captures if the state government changed during the committee's tenure. Second, we dis-aggregate our results across aligned and non-aligned areas. Finally, we examine if there are any patterns in the technical queries raised by the committee across its tenure. Queries are raised by the committee if they find that the documents submitted by the firm have missing or incomplete information.

Government Change and Time Taken

We examine if the tenure cycle results differ across committees that experience a change in government vs. those that do not. To examine heterogeneity across these categories, we run an interaction model. The interaction term captures the differences in overall tenure cycle effects across the two categories. The positive coefficient on the interaction term points towards lower learning in committees that see a change in state government. We interpret this result (See Table 7) as a disruption in the group dynamics due to a change in government. When a new government comes to power, it is likely to have a new set of priorities - it would like to favor a different set of firms or might want certain regions to be prioritized. In such a case, the shared norms established within the group are likely to be disrupted. As the results show the rate of reduction in time taken to approve projects is slower in committees that experience government change.

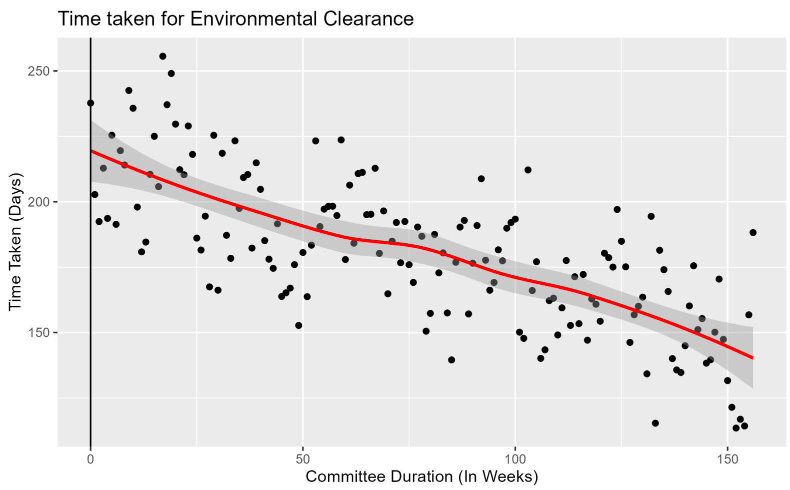

Figure 5: Political Cycle in Project Approval Rate Across States

The graph shows that the duration of the committee (measured in weeks) responsible for assessing the technical criteria of a project for granting clearances is strongly predictive of the time taken by the projects to get environmental clearances. This includes all project categories - non-coal mining, industrial projects, and infrastructural projects. Each dot in this graph represents the time taken by projects submitted in a particular week in a state that was granted environmental clearance. The left side of the graph represents the initial period after the formation of the committee, while the right side represents the time closer to the end of the committee [a]. The data represents all the projects submitted from 2017 to 2023 across all major states of India. The red line fits a loess through the data points.

[a] We have restricted this graph to only the full term of the committees, i.e., 3 years. In some exceptional cases, committees go beyond 3 years

Political Alignment and Project Approval

Second, we look at whether political alignment between the local level politician and the government in power influences the time taken to get an environmental clearance. To examine this relationship, we again interact with the main independent variable $\tau_{i,t}$ with a binary variable of alignment. We find that the interaction term is positive (See Table 6), indicating that when the committee engages with projects originating from aligned locations, the learning is lower. We interpret this result as the MLA acting as an external veto player whose preferences increase the time taken to reach a consensus. While the committee might have developed an understanding of how to coordinate projects, the presence of an external member with veto power requires additional coordination, making it more time-consuming to come to a consensus.

Queries and Committee Tenure

Finally, we look at whether there are markers of quality of regulation that differ across the committee's tenure. We examine the incidence of queries raised by the SEAC and test if the probability of a query changes with duration of the committee. We find that the expert committee is more likely to raise a query towards the beginning of its tenure (See Table 5).

Discussion

We use a novel dataset on environmental approvals in India to examine the regulatory processes that serve an essential function of balancing economic growth and negative environmental spillovers. The process of getting an environmental clearance is essential for many firms engaged in a wide range of economic activity. We demonstrate that the time taken to get application approval follows a tenure cycle. The presence of a tenure cycle shows that the regulation of economic activity that impacts the environment is shaped by the group dynamics within the regulatory institution.

What explains the tenure cycle? We attribute the decrease in time taken to clear applications to the role of learning effects. The learning effects also point towards the presence of informal norms that shape how fast a group of experts arrive at a consensus regarding a project. To support this claim, we provide a few important pieces of evidence. First, we show that committees that experience a change in government do not experience a strong learning effect. Second, we show that alignment with local politicians moderates the learning effect. And finally, we also show that the propensity to scrutinize applications changes over time.

Taken together, these results open the black box of regulatory processes that have a wide range of government action. Rather than focusing on the capture of regulatory institutions or the role of electoral politics, we show that at the heart of the politics of environmental clearances are expert committees that exert an independent effect on the regulatory process. The dynamics within these committees and their engagement with one another and the external political environment play a big role in shaping the responsiveness of the state towards firms. Overall, the paper highlights the urgent need to examine regulator structures within developing democracies in order to achieve sustainable development.

Figures and Tables

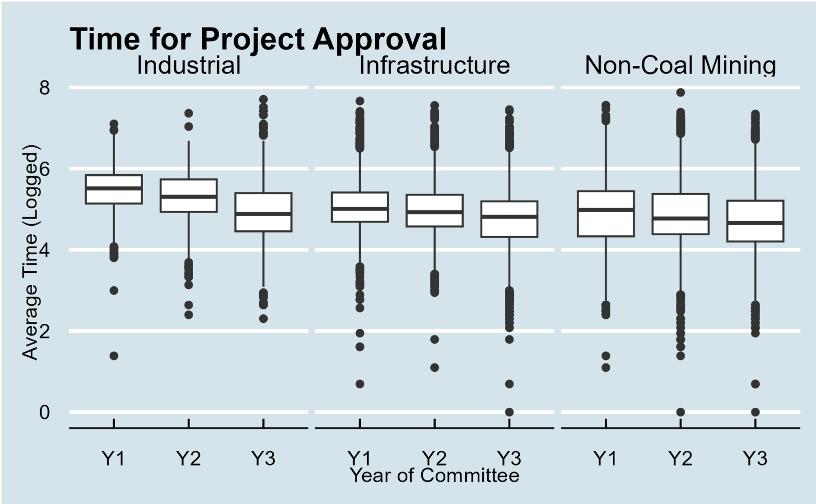

Figure 6: Bureaucratic Cycle in Time taken for Clearances

The graph shows changes in time taken to grant environmental clearances to projects across the duration of the technical expert committee. Most committees are appointed for a 3-year term. The projects have been divided into three broad categories - Industrial, Non-Coal Mining, and Infrastructure. The time taken is logged to account for outliers and variation across categories. As the box plots show the median time taken goes down across the years.

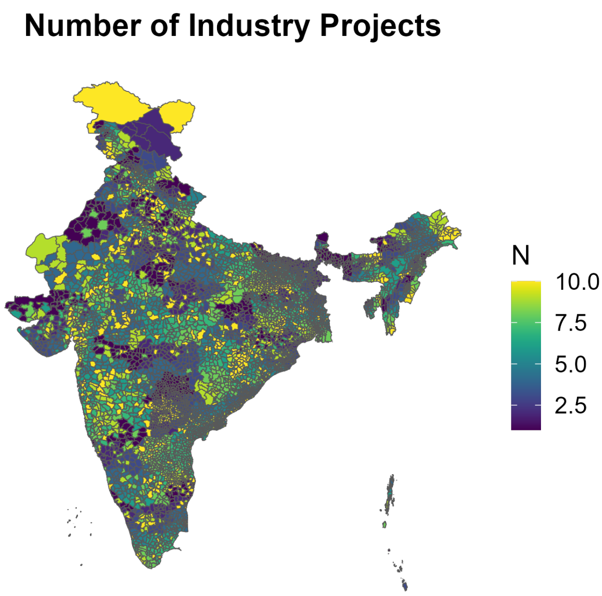

Figure 7: Spatial Distribution of Industrial Projects

The map shows the spatial distribution of Industrial projects submitted for environmental clearances at the sub-district level. The projects are divided across 10 quantiles within every state.

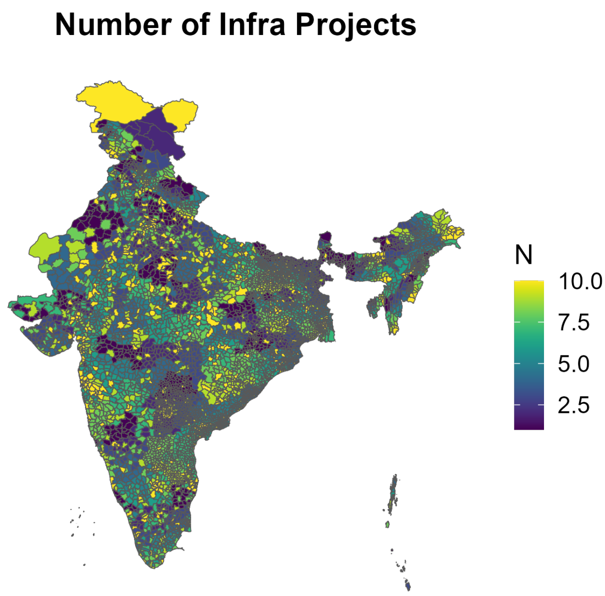

Figure 8: Spatial Distribution of Infra Projects

The map shows the spatial distribution of Infrastructure projects submitted for environmental clearances at the sub-district level. The projects are divided across 10 quantiles within every state.

Statistic	N	Mean	St. Dev.	Min	Max
Clearance Granted	62,977	0.64	0.48	0	1
Year	62,977	2,020.69	1.81	2,017	2,023
Alignement	55,475	0.65	0.48	0	1
Total Time	40,163	175.67	160.73	0	2,632
Project Type	35,148	0.14	0.35	0	1
Query SEAC	42,294	0.14	0.34	0	1
Commitee Size	62,976	10.58	2.79	5	15

Table reports descriptive statistics on the projects in our sample. Clearance Granted is binary indicator for whether the project was given a go-ahead by the state environment regulator. Year captures the year in which the project was submitted for approval. Alignment captures the vertical political alignment (coded as 1 if the MLA constituency from which the project was submitted was part of the party ruling the state) of the project based on the time and location of the project. Total Time measures the time taken for approval. The Project Type is a binary vairable which is 1 if the project is placed in the B1 sub-cateogry which requires firms to hold consultations with impacted communities. Finally, Query SEAC captures if the Expert commitee raises any queries based on initial assessment of document.

Table 1: Descriptive Statistics

Statistic	N	Mean	St. Dev.	Min	Max
Commitee Tenure Week	2,827	91.35	53.76	0	222
Percentage of Projects Granted EC	2,827	0.60	0.28	0.00	1.00
Projects Submitted	2,827	22.28	23.61	1	218
Projects Granted	2,827	14.36	16.47	0	188
Time Taken (Days)	2,579	211.33	169.28	9.00	1,788.50

Table reports descriptive statistics on the commitee cycle dataset which is derived from the indiviudal project level dataset by aggregated it at the week-state level. Project Submitted refers to the average number of applications submitted to the state environment regulator. YCommitee Tenure Week captures the week since the commitee was formed.Projects Submitted looks at how many of the projects were submitted and Projects Granted captures the number of projects granted the Environmental clearance. Time Taken captures the number of days taken to approve a project. The data includes all types of projects- Industrial, Infrastructure, and Non-Coal Mining

Table 2: Descriptive Statistics

	Time Taken (Days)			
	(1)	(2)	(3)	(4)
Committee Duration (Weeks)	-0.406^{***}	-0.193^{***}	-0.231^{***}	-0.226^{***}
	(0.016)	(0.016)	(0.016)	(0.017)
Submitted		-0.397^{***}	-0.338^{***}	-0.180^{***}
		(0.034)	(0.035)	(0.036)
State FE	No	Yes	No	No
Region FE	No	No	Yes	Yes
Year FE	No	Yes	Yes	Yes
Project Type FE	Yes	Yes	Yes	Yes
Observations	40,163	39,933	39,933	37,208
R^2	0.029	0.244	0.254	0.270
Adjusted R^2	0.029	0.244	0.253	0.268
Residual Std. Error	158.406	138.895	138.050	133.981

Note: *p<0.1; **p<0.05; ***p<0.01

The Table presents regression results that look at the relationship between commitee tenure (operationalized as the number of weeks since the committee was formed) and time taken for projects to be granted environmental clearances. We control for state, year, region, and broad project categories (Industrial, Non-Coal Mining, and Infrastructure). As the results indicate the relationship between committee tenure and time taken is -ve.

Table 3:

	Time Taken (Logged)			
	(1)	(2)	(3)	(4)
Committee Duration (Weeks)	-0.003^{***}	-0.002^{***}	-0.002^{***}	-0.002^{***}
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Submitted		-0.003^{***}	-0.003^{***}	-0.002^{***}
		(0.0002)	(0.0002)	(0.0002)
State FE	No	Yes	No	No
Region FE	No	No	Yes	Yes
Year FE	No	Yes	Yes	Yes
Project Type FE	Yes	Yes	Yes	Yes
Observations	40,163	39,933	39,933	37,208
R^2	0.061	0.253	0.269	0.295
Adjusted R^2	0.061	0.252	0.268	0.293
Residual Std. Error	0.760	0.677	0.670	0.655
Note:	*p<0.1; **p<0.05; ***p<0.01			

The Table presents regression results that look at the relationship between commitee tenure (operationalized as the number of weeks since the committee was formed) and time taken (logged) for projects to be granted environmental clearances. We control for state, year, region, and broad project categories (Industrial, Non-Coal Mining, and Infrastructure). As the results indicate the relationship between committee tenure and time taken is -ve.

Table 4:

	Probability of Query			
	(1)	(2)	(3)	(4)
Committee Duration (Weeks)	-0.001^{***}	-0.0003^{***}	-0.0002^{***}	-0.0001^{***}
	(0.00003)	(0.00003)	(0.00003)	(0.00004)
Submitted		0.0003^{***}	0.0002^{**}	0.0002^{**}
		(0.0001)	(0.0001)	(0.0001)
State FE	No	Yes	No	No
Region FE	No	No	Yes	Yes
Year FE	No	Yes	Yes	Yes
Project Type FE	Yes	Yes	Yes	Yes
Observations	42,294	42,012	42,012	39,169
R^2	0.054	0.278	0.291	0.306
Adjusted R^2	0.054	0.277	0.290	0.304
Residual Std. Error	0.333	0.290	0.287	0.288
Note:	*p<0.1; **p<0.05; ***p<0.01			

The Table presents regression results with technical query raised by the state expert appraisal committee (SEAC) as the main dependent variable. The main independent variable is the tenure of the committee (measured in weeks). As the results indicate the probability of a query being raised (the dependent variable is binary) goes down over the course of the committee's tenure

Table 5:

	Time Taken (days)
Committee Duration (Weeks)	-0.291^{***}
	(0.028)
Aligned	-4.709
	(3.269)
Submitted Count	-0.170^{***}
	(0.037)
Committee Duration:Aligned	0.070^{**}
	(0.032)
State FE	No
Region FE	Yes
Year FE	Yes
Project Type FE	Yes
Observations	36,061
R^2	0.270
Adjusted R^2	0.268
Residual Std. Error	135.377
Note:	*p<0.1; **p<0.05; ***p<0.01

The Table presents regression results where the main independent variable (the tenure of the committee, measured in weeks) is interacted with the political alignment between the government in power and local MLA (binary and equal to 1 if aligned).

Table 6:

	Time Taken (days)
Committee Duration (Weeks)	-0.299^{***}
	(0.020)
Govt Change	26.523^{***}
	(4.407)
Submitted Count	-0.178^{***}
	(0.036)
Committee Duration:Govt Change	0.131^{***}
	(0.038)
State FE	No
Region FE	Yes
Year FE	Yes
Project Type FE	Yes
Observations	37,207
R^2	0.273
Adjusted R^2	0.271
Residual Std. Error	133.724
Note:	*p<0.1; **p<0.05; ***p<0.01

The Table presents regression results where the main independent variable (the tenure of the committee, measured in weeks) is interacted with the change in government (binary and equal to 1 if government changes during the committee duration).

Table 7:

	Time Taken (days)
Committee Duration (Weeks)	-0.738^{***}
	(0.060)
Size of Committee	-6.334^{***}
	(0.656)
Submitted Count	-0.192^{***}
	(0.036)
Committee Duration:Size of Committee	0.049^{***}
	(0.005)
State FE	No
Region FE	Yes
Year FE	Yes
Project Type FE	Yes
Observations	37,207
R^2	0.272
Adjusted R^2	0.270
Residual Std. Error	133.804
Note:	*p<0.1; **p<0.05; ***p<0.01

The Table presents regression results where the main independent variable (the tenure of the committee, measured in weeks) is interacted with the committee size.

Table 8:

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