Online Appendix for:

The Value of Regulatory Discretion:
Estimates from Environmental Inspections in India

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Table C1: Probability of Regulator Acceptance on Treatment and Round, With Pollution

|                                | (1)      | (2)       | (3)       | (4)       | (5)       | (6)       |
|--------------------------------|----------|-----------|-----------|-----------|-----------|-----------|
| Inspection treatment assigned (=1) | 0.0129   | 0.00779   | 0.0127    | 0.0164    | 0.0106    | -0.0280   |
|                                | (0.0112) | (0.00926) | (0.0110)  | (0.0137)  | (0.00835) | (0.0207)  |
| Constant                        | 0.827*** | 0.869***  | 0.863***  | 0.861***  | 0.891***  | 0.910***  |
|                                | (0.00831)| (0.00701) | (0.00894) | (0.00974) | (0.00700) | (0.0134)  |
| Period                          |          |           |           |           |           |           |
| t > 3                           | -0.219***| -0.325*** | -0.323*** |          |           |           |
|                                | (0.0252) | (0.0350)  | (0.0557)  |          |           |           |
| t > 5                           | -0.0367  | 0.0293    | 0.0548    |          |           |           |
|                                | (0.0479) | (0.0366)  | (0.0610)  |          |           |           |
| t > 7                           | -0.0571  | -0.0224   | -0.125*   |          |           |           |
|                                | (0.0634) | (0.0396)  | (0.0682)  |          |           |           |
| Period × Treatment              |          |           |           |           |           |           |
| t > 3 × Inspection Treatment    | 0.0219   |          |           | 0.0322    |           |           |
|                                | (0.0344) |          |           | (0.0464)  |           |           |
| t > 5 × Inspection Treatment    | -0.0610  | -0.0248   |          |           |           |           |
|                                | (0.0638) |          |           | (0.0790)  |           |           |
| t > 7 × Inspection Treatment    | 0.0757   |          |           | 0.0920    |           |           |
|                                | (0.0821) |          |           | (0.0961)  |           |           |
| Lagged regulatory actions       |          |           |           |           |           |           |
| Warn, lag 1                     |          |           |           |           | 0.169***  | 0.150***  |
|                                |          |           |           |           | (0.0364)  | (0.0477)  |
| Punish, lag 1                   |          |           |           |           | -0.129*** | -0.101*   |
|                                |          |           |           |           | (0.0413)  | (0.0535)  |
| Lagged plant actions            |          |           |           |           |           |           |
| Firm: Protest, lag 1            |          |           |           |           |           | 0.0482*   |
|                                |          |           |           |           |           | (0.0272)  |
| Firm: Comply, lag 1             |          |           |           |           |           | 0.248***  |
|                                |          |           |           |           |           | (0.0329)  |
| Last pollution reading          |          |           |           |           |           |           |
| 0-1x                            | -0.0102  | 0.0140    | 0.000305  |          |           |           |
|                                | (0.0158) | (0.0211)  | (0.0119)  |          |           |           |
| 1-2x                            | -0.0661***| -0.0534***| -0.0524***| -0.0661***|          |           |
|                                | (0.0134) | (0.0207)  | (0.0105)  | (0.0205)  |          |           |
| 2-5x                            | -0.109***| -0.120*** | -0.0896***| -0.119*** |          |           |
|                                | (0.0151) | (0.0251)  | (0.0120)  | (0.0216)  |          |           |
| 5x +                            | -0.160***| -0.178*** | -0.116*** | -0.144*** |          |           |
|                                | (0.0260) | (0.0375)  | (0.0189)  | (0.0308)  |          |           |
| Pol Reading × Treatment         |          |           |           |           |           |           |
| 0-1x × Inspection Treatment     | -0.0424  |          |           |           |           |           |
|                                | (0.0309) |          |           |           |           |           |
| 1-2x × Inspection Treatment     | -0.0221  | 0.0239    |          |           |           |           |
|                                | (0.0271) |          |           |           |           |           |
| 2-5x × Inspection Treatment     | 0.0186   | 0.0497*   |          |           |           |           |
|                                | (0.0313) |          |           |           |           |           |
| 5x + × Inspection Treatment     | 0.0330   | 0.0452    |          |           |           |           |
|                                | (0.0516) |          |           |           |           |           |
| Inspection control mean         | 0.827    | 0.827     | 0.827     | 0.827     | 0.827     | 0.827     |
| Observations                    | 8897     | 8897      | 8897      | 8897      | 4089      | 8897      |

Does not include region fixed effects. Standard errors clustered at plant level in parentheses. Omitted actions are Ignore (for Regulator) and Inspect (for Firm). Omitted pollution reading for column (6) is No Pollution Reading Taken.* p < 0.10, ** p < 0.05, *** p < 0.01
Table C2: Attrition in the Endline Survey

|                        | N (1) | % (2) |
|------------------------|-------|-------|
| Survey completed       | 791   | 82.4  |
| Plant closed           | 124   | 12.9  |
| Plant refused survey   | 5     | 0.5   |
| Other                  | 40    | 4.2   |
| Total                  | 960   | 100.0 |

The table shows how many plants completed the endline survey, and the reasons for attrition for those that did not. Plant closed includes plants that were permanently closed (111), plants that were temporarily closed, and plants where production was temporarily suspended. Refused survey includes plants that were operating at the time of the visit, but that refused to respond to the questions in the survey. Other includes plants that moved to an unknown address, and plants for which an incorrect address had been recorded.

Table C3: Endline Attrition by Inspection Treatment Status

|                        | Treatment (1) | Control (2) | Difference (3) |
|------------------------|---------------|-------------|----------------|
| Survey completed       | 0.840         | 0.808       | 0.031          |
|                        | [0.367]       | [0.394]     | (0.024)        |
| Plant closed           | 0.123         | 0.135       | -0.013         |
|                        | [0.329]       | [0.343]     | (0.022)        |
| Plant refused survey   | 0.008         | 0.002       | 0.006          |
|                        | [0.091]       | [0.046]     | (0.005)        |
| Other                  | 0.029         | 0.054       | -0.025*        |
|                        | [0.168]       | [0.227]     | (0.013)        |
| Observations           | 480           | 480         |

The table shows differences in endline responses and reasons for attrition between the treatment and control groups. Columns (1) and (2) show means with standard deviations in brackets. Column (3) shows the coefficient on treatment from regressions of each characteristic on inspection treatment assignment, region fixed effects, and audit sample control. Reported are treatment effects, with region controls. Plant closed includes plants where production was temporarily suspended, and plants that were temporarily or permanently closed. Refused survey includes plants that were in production at the time of the visit, but that refused to respond to the questions in the survey. Other includes plants that moved to an unknown address, and plants for which an incorrect address had been recorded. * p < 0.10, ** p < 0.05, *** p < 0.01.
| Round | Player   | Action | Document          | Date       |
|-------|----------|--------|-------------------|------------|
| 1     | GPCB     | Inspect| Inspection report | 2008-09-05 |
| 2     | Plant    | Ignore |                   | 2008-09-05 |
| 3     | GPCB     | Punish | Closure Direction | 2009-01-12 |
| 4     | Plant    | Comply | Equipment installed | 2009-01-28 |
| 5     | GPCB     | Inspect| Inspection report | 2009-01-31 |
| 6     | Plant    | Ignore |                   | 2009-01-31 |
| 7     | GPCB     | Inspect| Inspection report | 2009-02-04 |
| 8     | Plant    | Ignore |                   | 2009-02-04 |
| 9     | GPCB     | Punish | Closure Direction | 2009-05-22 |
| 10    | Plant    | Comply | Process installed | 2009-05-30 |
| 11    | GPCB     | Inspect| Inspection report | 2009-06-16 |
| 12    | Plant    | Comply | Process installed | 2009-06-16 |
| 13    | GPCB     | Accept | Revocation of Closure Direction | 2009-06-24 |

The table displays a 13-round chain of interactions between GPCB and one plant during the experiment. Column (3) indicates the category of action, while Column (4) reports the underlying document to which the action corresponds. Ignore actions by the plant in Rounds 2, 6 and 8 have been imputed based on adjacent actions in the chain and hence Column (4) is left blank in these rounds. All chains begin with a regulatory inspection, Inspect. The players then alternate moves until the regulator decides to Accept the plant’s compliance for the time being, which terminates the chain. Table 1 in the paper describes the way in which the actions are mapped to the underlying documents, and the Data Appendix provides a full explanation of the rules used to construct the chains.
The table shows the differences in the number of different types of inspections between the treatment and control groups during the treatment period of approximately two years. A treatment inspection is an inspection that was assigned as part of the treatment, or a follow-up inspection that follows such an inspection in the same chain. Columns (1) and (2) show means with standard deviations in brackets. Column (3) shows the coefficient from regressions of each variable on treatment, where each regression includes region fixed effects and a control for the audit sample. The table uses administrative data from during the experiment. * \( p < 0.10 \), ** \( p < 0.05 \), *** \( p < 0.01 \)

|                          | Treatment (1) | Control (2) | Difference (3) |
|--------------------------|---------------|-------------|----------------|
| Inspections              | 2.98          | 1.40        | 1.59***        |
|                          | [1.72]        | [1.60]      | (0.096)        |
| Inspections, as part of treatment | 1.62          | 0           | 1.62****       |
|                          | [0.74]        | [0]         | (0.031)        |
| Inspections, not part of treatment | 1.37          | 1.40        | -0.029         |
|                          | [1.36]        | [1.60]      | (0.089)        |
| Inspections, not part of treatment, first day of chain | 1.21          | 1.28        | -0.062         |
|                          | [1.18]        | [1.38]      | (0.077)        |
| Inspections, not part of treatment, after first day of chain | 0.12          | 0.088       | 0.035          |
|                          | [0.35]        | [0.34]      | (0.022)        |

Observations 480 480
Table C6: Endline Pollution and Compliance on Treatments

|                                | Pollution (1) | Compliance (2) |
|--------------------------------|---------------|----------------|
| Ahmedabad, Audit treatment (=1)| 0.611***      | 0.635***       |
|                                | (0.104)       | (0.0439)       |
| Ahmedabad, Audit control (=1)  | 1.092***      | 0.584***       |
|                                | (0.284)       | (0.0436)       |
| Ahmedabad, Audit ineligible (=1)| 0.691***    | 0.726***       |
|                                | (0.261)       | (0.0322)       |
| Ahmedabad, Audit treatment × Inspection treatment (=1) | 0.0758 | -0.0169       |
|                                | (0.210)       | (0.0597)       |
| Ahmedabad, Audit control × Inspection treatment (=1) | -0.446 | 0.104*        |
|                                | (0.300)       | (0.0573)       |
| Ahmedabad, Audit ineligible × Inspection treatment (=1) | -0.0551 | 0.0457       |
|                                | (0.285)       | (0.0418)       |
| Surat, Audit treatment (=1)    | 0.524***      | 0.589***       |
|                                | (0.0242)      | (0.0208)       |
| Surat, Audit control (=1)      | 0.656***      | 0.570***       |
|                                | (0.0866)      | (0.0219)       |
| Surat, Audit treatment × Inspection treatment (=1) | 0.212 | 0.00523       |
|                                | (0.134)       | (0.0318)       |
| Surat, Audit control × Inspection treatment (=1) | -0.0648 | 0.00803       |
|                                | (0.0979)      | (0.0330)       |
| Valsad (=1)                    | 0.535***      | 0.618***       |
|                                | (0.0583)      | (0.0337)       |
| Valsad × Inspection treatment (=1) | -0.0324 | 0.0380       |
|                                | (0.0908)      | (0.0467)       |
| Observations                   | 4168          | 4168           |

The table shows regressions of pollution (column 1) and compliance (column 2) on treatment assignments at the plant-by-pollutant level. Pollution consists of air and water pollution readings for each plant, taken during the endline survey, where each pollutant is standardized by dividing by its standard deviation. Compliance is a dummy for each pollutant being below its regulatory standard. Standard errors clustered at the plant level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
### Table C7: Placebo Check of Alternate Compliance Thresholds

|                                | [0, $\bar{p}$) | [0, 2$\bar{p}$) | [0, 5$\bar{p}$) | [0, 10$\bar{p}$) |
|--------------------------------|----------------|----------------|----------------|------------------|
| Inspection treatment assigned (=1) | 0.0366* | 0.0144 | 0.00323 | -0.000368 |
|                                | (0.0213) | (0.0193) | (0.0131) | (0.00824) |
| Audit treatment assigned (=1)  | 0.0288 | 0.0154 | 0.0123 | 0.0166* |
|                                | (0.0258) | (0.0238) | (0.0162) | (0.00917) |
| Audit $\times$ inspection treatment (=1) | -0.0365 | -0.0245 | -0.0109 | -0.0106 |
|                                | (0.0353) | (0.0316) | (0.0214) | (0.0116) |
| Inspection and audit control mean | 0.614 | 0.813 | 0.928 | 0.975 |
| Observations                    | 4168 | 4168 | 4168 | 4168 |

The table presents regression estimates for compliance on inspection treatment assignment and audit treatment assignment, using pollution levels taken from the endline survey. Compliance is defined as pollution being below N times the limit $\bar{p}$, with N being 1, 2, 3, 5 and 10 respectively. Pollution standardized by backcheck standard deviation. Standard errors in parentheses. Includes audit treatment and treatment interaction controls, and year and region fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

### Table C8: Endline Pollution and Compliance on Letter Treatment

|                                | Pollution | Compliance |
|--------------------------------|-----------|------------|
|                                | (1)       | (2)        |
| Inspection treatment assigned (=1) | -0.0160 | 0.0248 |
|                                | (0.0866) | (0.0238) |
| Letter treatment assigned (=1)  | -0.0482 | 0.0311 |
|                                | (0.0928) | (0.0241) |
| Inspection treatment $\times$ Letter treatment (=1) | 0.0326 | -0.00340 |
|                                | (0.130) | (0.0345) |
| Inspection and Letter control mean | 0.652 | 0.595 |
| Observations                    | 4168 | 4168 |

The table shows regressions of pollution (column 1) and compliance (column 2) on inspection and letter treatment assignments. Observations are at the plant-by-pollutant level, where pollution consists of air and water pollution readings for each plant, taken during the endline survey, and each pollutant is standardized by dividing by its standard deviation. Compliance is a dummy for each pollutant being below its regulatory standard. The table regresses these outcomes on inspection treatment assignment, letter treatment assignment and inspection $\times$ letter treatment. The letter treatment was a letter sent by the regulator to plants shortly before the endline survey reiterating the terms of plants' environmental consents and reminding them of their obligations to meet emissions limits. Specifications also include region fixed effects. Standard errors clustered at the plant level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. 
Table C9: Multinomial Logit, Regulatory Machine Conditional Choice Probabilities: Interaction of Past Actions of Regulator and Plant

|                         | Inspect (1) | Warn (2)   | Punish (3) |
|-------------------------|-------------|------------|------------|
| **Lagged regulatory actions** |             |            |            |
| Warn, lag 1             | 0.33        | -2.04***   | -2.11***   |
|                         | (0.23)      | (0.32)     | (0.31)     |
| Punish, lag 1           | 1.80***     | -2.03***   | -0.60*     |
|                         | (0.23)      | (0.56)     | (0.33)     |
| **Lagged plant actions** |             |            |            |
| Firm: Comply, lag 1     | -1.71***    | -0.89*     | -1.05*     |
|                         | (0.60)      | (0.47)     | (0.54)     |
| **Lagged regulatory action × Lagged plant action** |             |            |            |
| Punish, lag 1 × Firm: Comply, lag 1 | -0.12 | -13.4 | 0.46 |
|                         | (0.71)      | (863.3)    | (0.75)     |
| **Last observed pollution reading** |             |            |            |
| 0-1x                    | -0.38       | -0.26      | 0.053      |
|                         | (0.23)      | (0.16)     | (0.24)     |
| 1-2x                    | -0.20       | 0.55***    | 0.36**     |
|                         | (0.16)      | (0.098)    | (0.18)     |
| 2-5x                    | -0.17       | 0.84***    | 0.70***    |
|                         | (0.17)      | (0.10)     | (0.17)     |
| 5x +                    | 0.27        | 0.63***    | 1.15***    |
|                         | (0.21)      | (0.16)     | (0.21)     |
| **Period**              |             |            |            |
| Constant                | -4.41***    | -2.47***   | -3.91***   |
|                         | (0.13)      | (0.057)    | (0.11)     |
| t > 3                   | 2.91***     | 1.26***    | 2.57***    |
|                         | (0.25)      | (0.28)     | (0.27)     |
| t > 5                   | 0.073       | -0.35      | -0.50      |
|                         | (0.21)      | (0.32)     | (0.30)     |
| t > 7                   | 0.060       | -0.55      | 0.55*      |
|                         | (0.24)      | (0.37)     | (0.29)     |

Observations 8897

Omitted action for regulator is Inspect
Table C10: Multinomial Logit, Regulatory Machine Conditional Choice Probabilities: Interaction of Past Actions and Pollution

|                          | Inspect (1) | Warn (2) | Punish (3) |
|--------------------------|-------------|----------|------------|
| **Lagged regulatory actions** |             |          |            |
| Warn, lag 1              | 0.48**      | -1.94*** | -2.09***   |
|                          | (0.24)      | (0.35)   | (0.37)     |
| Punish, lag 1             | 1.80***     | -2.42*** | -0.20      |
|                          | (0.26)      | (0.76)   | (0.35)     |
| **Lagged plant actions**  |             |          |            |
| Firm: Comply, lag 1      | -1.43***    | -0.44    | -0.70      |
|                          | (0.39)      | (0.53)   | (0.50)     |
| **Last observed pollution reading** |         |          |            |
| 0-1x                     | -0.36       | -0.25    | 0.048      |
|                          | (0.23)      | (0.16)   | (0.24)     |
| 1-2x                     | -0.21       | 0.55***  | 0.36**     |
|                          | (0.16)      | (0.098)  | (0.18)     |
| 2-5x                     | 0.020       | 0.87***  | 0.79***    |
|                          | (0.29)      | (0.10)   | (0.19)     |
| 5x +                     | 0.54        | 0.68***  | 1.25***    |
|                          | (0.33)      | (0.16)   | (0.22)     |
| **Lagged action × Last observed pollution reading** |         |          |            |
| Warn, lag 1 × 2-5x       | -0.51       | -0.23    | 0.012      |
|                          | (0.38)      | (0.43)   | (0.49)     |
| Warn, lag 1 × 5x +       | -0.48       | -0.94    | -0.20      |
|                          | (0.48)      | (1.05)   | (0.69)     |
| Punish, lag 1 × 2-5x     | 0.065       | 0.019    | -1.07      |
|                          | (0.46)      | (1.26)   | (0.72)     |
| Punish, lag 1 × 5x +     | 0.030       | 1.37     | -0.56      |
|                          | (0.58)      | (1.30)   | (0.73)     |
| Plant: Comply, lag 1 × 2-5x | -0.36     | -1.20    | -0.14      |
|                          | (0.78)      | (1.16)   | (0.93)     |
| Plant: Comply, lag 1 × 5x + | -2.00*   | -13.8    | -0.36      |
|                          | (1.17)      | (651.8)  | (0.88)     |
| **Period**               |             |          |            |
| Constant                 | -4.45***    | -2.47*** | -3.93***   |
|                          | (0.13)      | (0.057)  | (0.11)     |
| t > 3                    | 2.87***     | 1.26***  | 2.55***    |
|                          | (0.25)      | (0.28)   | (0.27)     |
| t > 5                    | 0.097       | -0.35    | -0.49      |
|                          | (0.21)      | (0.32)   | (0.31)     |
| t > 7                    | 0.053       | -0.54    | 0.55*      |
|                          | (0.25)      | (0.37)   | (0.29)     |
| Observations             | 8897        |          |            |

Omitted action for regulator is Inspect