

A Green Label, Uneven Change: Disclosure and Penalty-Based Compliance after National Green Factory Recognition

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Abstract: China's National Green Factory program recognizes specific production facilities, but listed companies may use this green identity in group-level environmental communication. We examine whether recognition increases listed firms' green disclosure and whether this change is matched by group-level penalty-based environmental compliance. Using panel data on 3,665 Chinese listed manufacturers from 2012 to 2023 and actual Ministry of Industry and Information Technology list publication dates, we estimate staggered-adoption effects. Recognition is followed by significantly higher green disclosure and a wider disclosure–compliance gap. The widening is concentrated among the early recognition cohorts. These results do not imply deliberate greenwashing or a deterioration in overall environmental performance. Instead, they show that a facility-level environmental credential can be followed by uneven changes in group-level communication and compliance. The study extends organizational decoupling research by linking facility recognition to listed-group outcomes. The governance of environmental recognition should therefore align the credential's coverage with the scope of subsequent corporate environmental claims.

Keywords: National Green Factory; Green disclosure; Penalty-based environmental compliance; Organizational decoupling; Corporate environmental responsibility; Cross-level accountability; Disclosure–compliance gap

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1. Introduction

Government environmental recognition turns evaluated practice into an organizational asset by attaching public legitimacy to selected producers^[1]. China's National Green Factory program makes these governance and communication consequences particularly salient. Recognition is granted to an industrial entity, but the recognized factory may belong to a listed corporate group whose environmental reporting and observed compliance records extend across multiple controlled subsidiaries. This creates the central question: after the official list is published, does the listed group's green communication remain aligned with its penalty-based

environmental compliance?

The complication is organizational. Listed-company reporting is relatively centralized, whereas production and compliance risks remain distributed across subsidiaries and production sites. A listed parent can incorporate a controlled factory's credential into group communication even though recognition does not evaluate every entity within the consolidated group. Reporting can thus respond at the group level while detected and sanctioned noncompliance continues to reflect conduct and enforcement across a wider network. Such divergence does not necessarily indicate failure to meet program standards or deliberate deception by the listed group.

Existing Green Factory research is largely organized around separate outcomes. Recognition has been associated with green innovation, environmental investment ^[2], and corporate environmental disclosure ^[3,4]. Capital markets also respond to the government endorsement embedded in recognition ^[5]. More broadly, institutional policy can reshape corporate ESG behavior ^[6]. These outcomes capture different parts of the organizational response: innovation and investment concern technical or operational change, disclosure concerns communication, and market reactions concern external valuation. What remains unresolved is whether changes in listed-group communication are matched by changes in externally recorded compliance.

This unresolved relationship brings organizational decoupling into focus. External social-responsibility communication and internal organizational action can develop along different paths ^[7], while environmental claims may exceed or understate outcomes derived from external records ^[8]. Studies have measured the substantive side of this relationship through emissions, ratings, innovation, organizational processes, and regulatory compliance, but these measures are not interchangeable ^[9]. We use administrative penalties as a narrow, externally recorded indicator of detected and sanctioned noncompliance. The question is not whether penalties fully represent environmental performance, but whether official recognition changes their movement relative to corporate green communication.

We examine this question using panel data on 3,665 Chinese A-share manufacturers from 2012 to 2023 and staggered-adoption estimates based on actual MIIT list publication dates. Recognition is followed by higher green disclosure and a wider disclosure–compliance gap. The gap is concentrated among the earliest publication-year cohorts.

The paper shifts the evaluation of National Green Factory recognition from isolated policy outcomes to cross-level organizational alignment. It extends organizational decoupling research by showing that communication–practice alignment also depends on organizational scope: recognition is conferred at the production-entity level, while disclosure and penalty-based compliance are observed at the listed-group level. This cross-level structure creates a responsibility problem distinct from deliberate greenwashing. Even a factually valid environmental claim can provide an incomplete signal when its implied organizational scope is broader than the scope of the underlying evaluation. Corporate environmental responsibility therefore includes keeping visible which entity was evaluated, not only avoiding false claims. This framework explains why facility-level environmental recognition can generate group-level communication effects that are not matched by group-wide compliance outcomes.

2. Theoretical framework and hypotheses

2.1. Recognition as substantive governance

Environmental recognition can improve corporate conduct when entry standards, monitoring, and reputational benefits reinforce one another. The green-club framework treats certification as a governance arrangement

in which common standards and a valuable public label discourage participants from avoiding substantive obligations. The National Green Factory program shares this combination of selection standards and reputational benefits, but its identity is conferred by the government on a production entity rather than purchased or self-declared by a listed group. Implementation quality still conditions whether formal environmental systems produce favorable outcomes ^[10]. Recent studies link National Green Factory recognition to green innovation ^[11] and environmental investment. These findings establish a substantive-governance pathway through which firms may invest, innovate, and reorganize operations in response to official recognition.

This substantive potential does not imply that every organizational outcome changes together. Equipment renewal, process redesign, employee implementation, and coordination across subsidiaries require financial resources, managerial effort, and time. Formal environmental systems can also become audit-oriented structures that remain weakly integrated into daily routines ^[12]. Innovation, investment, production outcomes, and regulatory compliance therefore capture different parts of organizational adjustment. Improvement in one part challenges a purely symbolic interpretation of recognition, but it does not establish that listed-group communication and detected noncompliance move in step.

2.2. Official green identity and listed-group disclosure

National Green Factory recognition differs from a private environmental label because government selection makes the identity both public and institutionally credible. Capital market reactions indicate that outside audiences value this endorsement, increasing the reputational return to communicating the official identity. Prior work in the same institutional setting finds greater environmental disclosure quality or incidence after recognition. Disclosure quality, incidence, and the intensity examined here remain distinct constructs. Their common implication is more limited: recognition is followed by greater corporate environmental reporting rather than replacing the need for such reporting.

The communication response can cross formal entity boundaries. Recognition compresses a factory-level evaluation into a visible credential, while the listed parent prepares the consolidated report and manages the group's external communication. In listed business groups, affiliate-level social-responsibility activity can enter parent-level reporting and shared reputation ^[13]. When the listed parent or a controlled factory obtains official recognition, the group gains both an incentive and an organizational channel for expanding green communication. Disclosure intensity therefore provides the communication-side outcome needed to evaluate the subsequent disclosure-compliance relationship.

H1: National Green Factory recognition increases listed firms' green disclosure Intensity

2.3. Cross-level accountability and disclosure-compliance alignment

Recognition operates across an uneven organizational map. The listed parent coordinates consolidated reporting, whereas production and compliance risks remain distributed across subsidiaries and production sites. A credential granted to one production entity can enter the group's environmental narrative without extending the underlying evaluation to every entity in the controlled network. Evidence that certification can reduce some forms of greenwashing or promote green innovation does not contradict this scope mismatch, because those findings concern different organizational margins ^[14].

The two outcomes also emerge from different organizational processes. The public credential raises the immediate reputational return to communicating recognized status, and report content can be revised by highlighting existing information or incorporating the recognized factory into a group narrative. Changes

in group-wide compliance may involve operational controls, equipment and process adjustment, employee implementation, and coordination across multiple facilities. Research on environmental communication likewise distinguishes relatively flexible external claims from more deeply embedded organizational action^[15]. Short response windows can therefore reveal divergence even when substantive activity also occurs^[16]. This logic allows for different adjustment paths without imposing a fixed ordering on the two component responses.

Administrative penalties provide a narrow view of this relationship. They record detected and sanctioned noncompliance and also depend on regulatory scrutiny and enforcement. The disclosure–compliance gap therefore captures the relative movement of corporate green communication and an enforcement-dependent compliance margin, not environmental performance in its entirety. When a public credential strengthens group communication while group-wide penalty-based compliance does not move in the aligned manner implied by an unchanged gap, the observed gap widens. This prediction concerns cross-level alignment; it does not identify managerial intent, pollution deterioration, or permanent policy failure.

H2: National Green Factory recognition widens listed firms' green disclosure– penalty-based compliance gap.

3. Research design

3.1. Institutional setting and treatment timing

China's National Green Factory program is a national environmental recognition scheme introduced by the Ministry of Industry and Information Technology (MIIT) as part of China's green manufacturing system in 2016. Production entities apply voluntarily and proceed through self-assessment, independent third-party evaluation, provincial recommendation, and national review before MIIT publishes each approved list. Evaluation covers infrastructure, management systems, energy and resource use, emissions, and related environmental requirements. Because MIIT released the lists in successive batches rather than on a single date, listed groups became publicly associated with the official Green Factory identity at different points in time.

The successive publication of official lists provides staggered timing variation for a quasi-experimental design. We use this variation to compare changes around public recognition between listed groups that have been recognized and groups that have not yet been recognized. The quasi-experimental designation describes the staggered timing structure rather than random assignment: participation is voluntary, and entry into the recognized group remains selective. Identification therefore relies on conditional parallel trends after adjustment for observed covariates, together with outcome-specific assumptions regarding anticipation and treatment timing.

3.2. Data sources and sample construction

The analysis combines four data sources. Financial statements, ownership, industry classification, and other company characteristics come from CSMAR. National Green Factory records are compiled from the official MIIT lists and cross-checked against the CSMAR Green Factory database. Green disclosure and report length are constructed from the text of listed firms' annual reports. Environmental administrative-penalty records come from the Chinese Research Data Services Platform (CSRDN) and cover cases involving listed companies and their controlled subsidiaries. These sources are linked at the listed-company and fiscal-year level.

The initial financial panel contains 45,600 firm-year observations. We restrict the sample to A-share manufacturing firms from 2012 to 2023, require usable annual-report disclosures, penalty, and financial

datasets. We exclude observations with nonpositive total assets or leverage outside the unit interval. Zero environmental penalties are assigned only to firm-years successfully matched to the CSRDN database with no recorded cases. These restrictions yield an unbalanced panel of 27,247 firm-year observations across 3,665 listed firms. Panel entry and exit reflect listing dates and data availability, and the estimates apply to the merged sample rather than the entire population of listed manufacturers, as shown in **Table 1**.

Table 1. Sample construction

Step	Restriction	Firm-years
1	Union of raw financial records	45,600
2	A-share manufacturing firms, 2012–2023	29,543
3	Covered by annual-report disclosure data	27,762
4	Merged disclosure, penalty, and financial panel	27,411
5	Positive total assets	27,411
6	Leverage between zero and one	27,247

3.3. Treatment assignment and public timing

The unit of analysis is the listed company-year, while National Green Factory recognition is granted to production entities. A listed company enters treatment when the parent or a verified controlled factory within its consolidated group first receives recognition. We identify the earliest qualifying record using stock-code links, company names, ownership records, and manual verification. Recognition-cycle labels differ from actual MIIT publication dates, particularly for the 2021–2023 cohorts. We therefore use the actual publication dates to determine treatment timing, ensuring that firms are classified as publicly recognized only after the corresponding MIIT lists were released, as shown in **Table 2**.

Table 2. Recognition cohorts and actual publication years

Recognition-cycle year	Actual publication year	Listed groups
2017	2017	52
2018	2018	106
2019	2019	86
2020	2020	65
2021	2022	66
2022	2023	74
2023	2024	101
Total	-	550

3.4. Outcome variables and covariates

The primary disclosure measure is based on the frequency of green transition terms in each annual report. We transform the count as $\ln(1 + \text{Greenwords}_{it})$, standardize it within calendar year, and winsorize the resulting measure annually at the 1st and 99th percentiles. The standardized outcome measures a firm's relative position within each reporting year rather than an absolute change in green-word use. This relative scale removes common annual shifts in disclosure language and places disclosure and penalties on comparable scales for constructing the gap. A higher value indicates more extensive green communication relative to other listed firms in the same reporting year. The measure captures the intensity of green language rather than the accuracy or

truthfulness of individual statements.

To distinguish disclosure intensity from variation in report length, we also construct:

$$\text{GreenWordsPer10k}_{it} = \frac{\text{GreenWords}_{it}}{\text{TotalAnnualReportWords}_{it}} \times 10,000$$

The length-adjusted measure retains the same green-word numerator as the primary measure. We additionally construct an indicator and a logged count for direct occurrences of the phrase “Green Factory” in annual reports. Data on total report length and direct mentions are available from 2016, so these supplementary measures use a shorter panel.

administrative-penalty records identify detected and sanctioned environmental violations involving the listed company or its controlled subsidiaries. A case is assigned to the year of the administrative penalty decision; when the decision date is unavailable, the violation year recorded by CSRDN is used. We aggregate the number of cases to the listed-group year, transform it as $\ln(1 + \text{PenaltyBad}_{it})$, and standardize it within calendar year. Let PenaltyBad_{it} denote the resulting adverse-compliance index, where higher values represent more administratively observed noncompliance. This measure does not capture total environmental performance: recorded penalties reflect underlying conduct together with regulatory detection, enforcement, and recording lags.

The relational outcome is defined as:

$$\text{Gap}_{it} = \text{Disclosure}_{it} + \text{PenaltyBad}_{it}$$

A higher value indicates a wider separation between green communication and the listed group’s penalty-based compliance position. The gap can increase through higher disclosure, more adverse penalty records, or both; it is therefore a relational measure rather than direct evidence of deliberate greenwashing or a comprehensive measure of environmental performance. The construction order is fixed throughout the main analysis. We first standardize the two logged components within each calendar year, add the standardized values, and then winsorize the composite gap annually at the 1st and 99th percentiles. This order limits the influence of extreme observations while retaining variation in the zero-heavy penalty distribution. For component interpretation, disclosure and the adverse-penalty index are separately winsorized at the same annual cutoffs and estimated under the same publication-year design. We then formally test whether their treatment responses differ. The robustness analysis also reconstructs the gap using fixed 2012–2016 standardization moments, avoiding exclusive reliance on each year’s contemporaneous cross-sectional distribution.

3.5. Estimation strategy

The primary estimates use the Callaway–Sant’Anna staggered difference-in-differences estimator. For each publication cohort g and year t , the group–time parameter is:

$$\text{ATT}(g,t) = E[Y_{it}(g) - Y_{it}(0) | G_i = g]$$

We estimate these parameters using a doubly robust estimator that combines outcome regression and inverse-probability weighting, with firms not yet recognized in year t serving as the contemporaneous comparison group. The six covariates are measured at the relevant untreated base period for each group–time comparison and enter both the outcome-regression and propensity-score models. The estimator is consistent when at least one of these two working models is correctly specified. It allows effects to vary across publication cohorts and event time and avoids comparisons in which already-treated firms serve as controls. The headline

overall ATT first averages the available post-publication effects within each cohort and then aggregates the cohort-specific effects using cohort shares. This prevents earlier cohorts from receiving greater weight solely because they have more observed post-publication years. Dynamic estimates instead aggregate cohorts observed at a common event time; their cohort composition can therefore change across the event window. As a robustness check, we also report a short-horizon average over event times 0 to +2.

H1: green disclosure. The H1 estimation uses an anticipation-adjusted risk set and reports event time relative to the actual publication year g . With one potential anticipation period, the universal base period is $g - 2$. Event time -1 is estimated separately as potential anticipation and is excluded from both the clean pre-trend test and the headline treatment effect. The reported H1 ATT aggregates only formal post-publication effects for $e \geq 0$. Firm and year fixed-effects OLS provides an auxiliary comparison:

$$\text{Disclosure}_{it} = \beta \text{H1Post}_{it} + \theta \text{H1Anticipation}_{it} + X'_{it} \gamma + \alpha_i + \lambda_t + \varepsilon_{it}$$

Where H1Post_{it} equals one from the actual publication year onwards and $\text{H1Anticipation}_{it}$ equals one only in year $g-1$. The fixed-effects estimate is used as a transparent comparison; the headline H1 result and dynamic path come from the heterogeneous-treatment-robust group–time estimator.

H2: disclosure–compliance gap. H2 uses the actual publication year as the start of treatment, imposes no anticipation period, and uses $g - 1$ as the universal base period.

Its overall ATT follows the same cohort-first aggregation rule. Firms whose lists are published after the sample window can serve as not-yet-treated controls in earlier years but contribute no post-publication observations.

Component estimates. We estimate disclosure and the adverse-penalty component separately, using the same sample, treatment timing, comparison group, covariates, and weighting specification. These estimates identify the respective contributions of the two components to the estimated gap; no separate component-difference outcome is used.

Inference and pre-treatment diagnostics. Inference for the group–time estimator uses influence-function variance at the listed-company level, and event-study figures report pointwise 95% confidence intervals. H1 tests the clean pre-publication event times $e \leq -3$, excluding the potential anticipation period $e = -1$ and the reference period $e = -2$. H2 tests all estimable pre-publication event times $e \leq -2$ relative to $e = -1$. For both outcomes, we report a joint test of the aggregated event-time leads and a more granular joint test of the underlying cohort–time pre-treatment effects. OLS standard errors are clustered by listed company.

3.6. Identification assumptions and boundaries

Identification requires conditional parallel trends between each recognition cohort and the firms that remain untreated in the corresponding comparison period. It also requires overlap in observed characteristics, the outcome-specific anticipation restrictions defined in Section 3.3, an absorbing treatment status after a listed group first becomes publicly recognized, and no differential spillovers that materially change the outcomes of not-yet-treated firms.

Voluntary application and selective recognition create the principal identification concern. Using pre-treatment covariates and not-yet-treated comparison firms can improve comparability on observed characteristics, but it cannot remove selection on unobserved factors. The event-study and cohort–time diagnostics therefore assess whether observable pre-publication paths are consistent with the conditional parallel-trends restriction. Failure to reject a joint pre-treatment test supports the design but does not establish

the assumption.

The estimand is also bounded by the organizational and measurement choices described above. Treatment is triggered by recognition of the listed parent or a verified controlled factory, whereas disclosure and penalties are measured for the consolidated listed group. The penalty outcome records administratively observed cases and may reflect enforcement and recording lags. Consequently, the design identifies changes in listed-group communication and penalty-based compliance around public recognition; it does not identify changes in every dimension of environmental performance or establish deliberate greenwashing

4. Main results

4.1. Recognition and green disclosure

Figure 1 plots the Callaway–Sant’Anna estimates around the actual MIIT publication year. Public-event time -2 is the reference period, and -1 is treated as a possible anticipation period. The estimates at -5 , -4 , and -3 are small; neither their joint test ($P = 0.188$) nor the cohort–time diagnostic ($P = 0.122$) rejects the pre-trend restriction. The estimate at -1 is positive but imprecise (0.051 , $P = 0.125$). Disclosure then rises in the publication year (0.117 , $P = 0.010$) and remains higher in the observed post-publication periods.

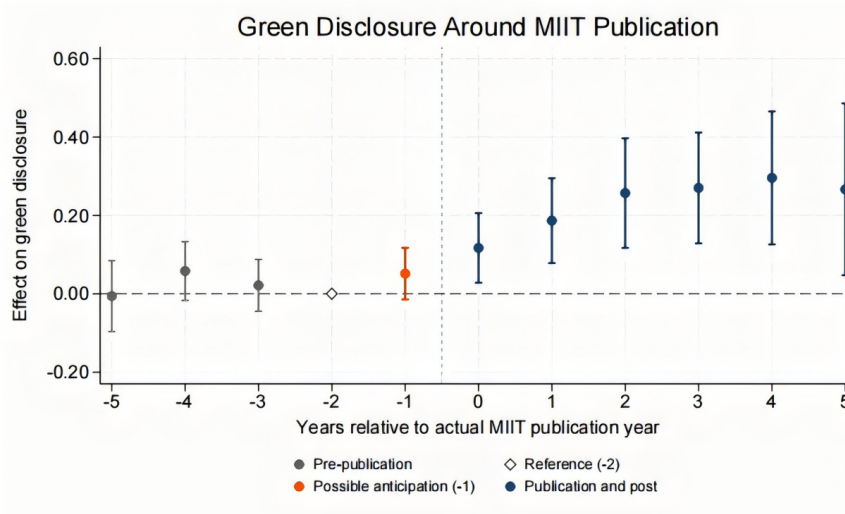


Figure 1. H1 event study around actual MIIT publication

The cohort–first disclosure ATT in **Table 3** is 0.182 ($SE = 0.047$, $P < 0.001$); this estimate excludes the potential anticipation period. The corresponding firm and year fixed-effects estimate for the formal post-publication period is 0.230 ($SE = 0.047$, $P < 0.001$), with a separately estimated anticipation coefficient of 0.081 ($SE = 0.038$, $P = 0.032$). Despite their different aggregation rules, both estimators indicate higher disclosure after publication.

Scaling the focal green-word count by total report length gives an estimate of 0.070 ($SE = 0.022$, $P = 0.001$); its cohort–time pre-period diagnostic is $P = 0.963$. The broader dictionary yields a smaller estimate of 0.043 ($P = 0.071$), so the result is more pronounced for the focal green-transition vocabulary than for environmental language in general. The probability of directly mentioning “Green Factory” increases by 0.276 ($P < 0.001$). Because its pre-period diagnostic is $P = 0.058$, we use this last result only as descriptive evidence that facility-

level status appears more often in listed-group reporting after recognition.

Table 3. Recognition and listed-firm green disclosure

Outcome and estimator	Estimate	SE	<i>P</i>	Pre-period <i>p</i>	Firm-years	Treated firms
Green disclosure: Callaway-Sant’Anna	0.182	0.047	<0.001	0.122	26,846	501
Green disclosure: FE OLS, formal post	0.230	0.047	<0.001	–	27,247	550
Green disclosure: FE OLS, anticipation	0.081	0.038	0.032	–	27,247	550
Focal green words per 10,000 report words	0.070	0.022	0.001	0.963	20,824	547
Alternative dictionary per 10,000 report words	0.043	0.024	0.071	0.056	20,824	547
Any direct “Green Factory” mention	0.276	0.028	<0.001	0.058	20,726	547

These results support H1: listed-firm green disclosure increases after National Green Factory recognition becomes public. We next ask whether penalty-based compliance moves with that disclosure response.

4.2. Recognition and the disclosure–compliance gap

Figure 2 uses the actual MIIT publication year and the annually 1/99-winsorized gap, with public-event time -1 as the reference. None of the displayed coefficients from -5 through -2 is individually significant, and their joint test does not reject at the 5% level ($P = 0.095$). The cohort–time test does reject ($P = 0.019$), however, showing that the aggregated event-time coefficients mask departures in some underlying comparisons. The estimate is 0.039 in the publication year ($P = 0.525$) and 0.161 in year $+1$ ($P = 0.056$). It becomes statistically positive in year $+2$, reaching 0.255 ($P = 0.017$). Later estimates remain positive, although progressively fewer cohorts support them; they do not describe a common growth path for all recognition rounds.

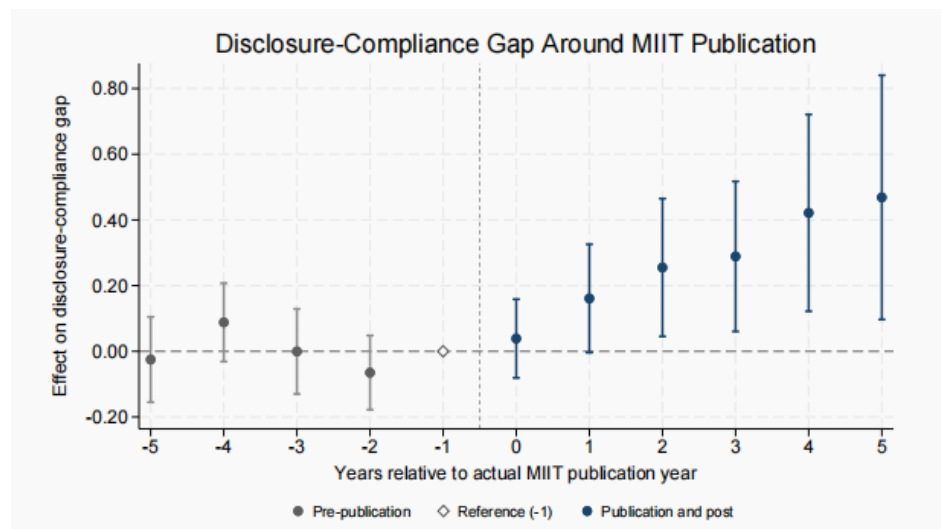


Figure 2. H2 event study around actual MIIT publication

The preferred cohort–first ATT is 0.181 (SE = 0.068, $P = 0.008$; 95% CI [0.047, 0.314]). As shown in **Table 4**, the estimate remains positive without firm covariates (0.111), with ten covariates (0.190), and when comparison firms are required to remain untreated throughout the sample (0.196). Averaging event times 0 through $+2$ gives 0.152 (SE = 0.074, $P = 0.041$).

Table 4. Core H2 estimates under actual MIIT publication timing

Specification	ATT	SE	<i>P</i>	Displayed pre <i>P</i>	Cohort-time pre <i>P</i>	Firm-years	Treated firms
Preferred: six covariates, not-yet-treated	0.181	0.068	0.008	0.095	0.019	26,749	410
No firm covariates	0.111	0.052	0.033	0.027	0.024	26,749	410
Ten covariates	0.190	0.070	0.007	0.048	0.067	25,271	410
Untreated-through-sample comparison	0.196	0.073	0.007	0.066	0.044	26,694	401
Event-time average, 0 to +2	0.152	0.074	0.041	—	—	26,749	410

H2 is supported under the preferred public-timing specification, and the positive short-horizon average indicates that the result is not confined to the longest observed post-treatment periods. Its causal interpretation nevertheless remains bounded by the rejecting cohort–time diagnostic.

4.3. Component decomposition

Table 5 estimates the two components on the same H2 sample and timing. The cohort-first ATT is 0.081 for disclosure ($SE = 0.037$, $P = 0.027$) and 0.110 for the adverse-penalty measure ($SE = 0.053$, $P = 0.039$). Both components show positive estimated responses under the same treatment design.

Table 5. Component estimates under actual MIIT publication timing

Outcome	ATT	SE	<i>P</i>	95% CI	Displayed pre <i>P</i>	Cohort-time pre <i>P</i>
Green disclosure	0.081	0.037	0.027	[0.009,0.153]	0.032	0.217
Adverse penalty-based compliance	0.110	0.053	0.039	[0.005,0.214]	0.192	<0.001

The pre-treatment evidence differs across the two components. The cohort–time test does not reject for disclosure ($P = 0.217$) but rejects for the adverse-penalty measure ($P < 0.001$). We therefore do not interpret the penalty estimate as evidence that recognition caused environmental compliance to deteriorate. The decomposition supports the narrower conclusion that disclosure increased without a corresponding improvement in penalty-based compliance; H2 remains a test of the composite gap.

5. Robustness and identification boundaries

This section examines the stability of the positive disclosure–compliance gap reported in Section 4. The checks vary the construction of both components, shorten the post-publication horizon, remove publication-year cohorts, inspect overlap and weights, reassign placebo treatment, and relax the maintained trend assumptions. The results preserve the positive average estimate under the main alternative constructions but also locate it primarily in the earliest publication-year cohorts and show where its causal interpretation remains conditional.

5.1. Alternative outcome and disclosure constructions

To assess the robustness of the baseline gap, we standardize disclosure and penalties using fixed 2012–2016 means and standard deviations. The gap remains positive ($ATT = 0.213$, $P = 0.012$), compared with 0.181 under annual standardization. Replacing penalty counts with a binary indicator of group-level environmental penalties yields a similar result ($ATT = 0.203$, $P = 0.013$), with no rejected pre-period diagnostics. For H1, excluding literal occurrences of “Green Factory” from the green-word count leaves the disclosure effect positive ($ATT = 0.121$, $P = 0.012$), indicating that the increase extends beyond repetition of the official label. These robustness

results are reported in **Table 6**.

Table 6. Alternative outcome and disclosure constructions

Outcome construction	ATT	SE	<i>P</i>	95% CI	Displayed pre <i>P</i>	Cohort pre <i>P</i>	Observations
Panel A.H2 alternative gap constructions							
Baseline	0.181	0.068	0.008	[0.047,0.314]	0.095	0.019	26,749
Annual-standardized							
Count gap							
Fixed 2012–2016	0.213	0.085	0.012	[0.047,0.379]	0.080	0.010	26,749
standardization							
Any-penalty gap	0.203	0.082	0.013	[0.043,0.363]	0.598	0.241	22,211
Panel B.H1 textual measurement							
Baseline disclosure	0.182	0.047	<0.001	[0.089,0.275]	0.188	0.122	26,846
measure							
Excluding literal	0.121	0.048	0.012	[0.026,0.215]	0.177	0.123	26,846

5.2. Post-treatment robustness and identification diagnostics

The positive gap is also present over a shorter post-treatment horizon. Averaging event times 0 through +2 yields an ATT of 0.152 ($P = 0.041$), indicating that the overall estimate is not driven solely by longer post-publication periods. Leave-one-cohort-out estimates remain positive, although excluding the 2017 or 2018 cohort produces the largest reductions in magnitude. Removing both cohorts jointly reduces the ATT from 0.181 to 0.050 ($P = 0.471$), indicating that the average effect is concentrated in the earliest publication-year cohorts rather than shared uniformly across later cohorts.

The weighting diagnostics indicate adequate overlap on observed covariates. The maximum absolute standardized difference falls from 1.087 before weighting to 0.026 after weighting, while tighter propensity-score trimming leaves the ATT unchanged at 0.181. These checks suggest that the estimate is not driven by poor overlap or observations near the support boundary, although they cannot address selection on unobservables.

Firm-level placebo reassignment does not reproduce the observed effect. The actual fixed-effects estimate is 0.208, compared with a placebo mean of -0.003 , with an empirical P -value of 0.002. This exercise provides a falsification check rather than an alternative estimate of the CSDID ATT.

Finally, Rambachan–Roth sensitivity analysis shows that the 95% interval for the 0-to-(+2) effect changes from $[0.006, 0.297]$ under the maintained trend restriction to $[-0.049, 0.346]$ when permitted deviations reach one quarter of the largest observed pre-treatment deviation. The result therefore remains sensitive to modest departures from parallel trends.

6. Discussion

Public Green Factory recognition produces a cross-level organizational response. Once the MIIT list is published, a credential attached to a specific production facility becomes publicly verifiable and can be incorporated into consolidated corporate reporting. Consistent with this mechanism, listed groups increase green disclosure after recognition, including when report length is controlled for and literal references to “Green Factory” are removed. Yet the recognized entity and the reporting entity are not necessarily identical: a facility-

specific achievement can enter listed-group communication even though the underlying evaluation does not extend to every entity within the corporate group.

The disclosure–compliance gap therefore reflects different organizational scopes and adjustment processes: stronger group-level green communication is not matched by a corresponding improvement in penalty-based compliance. The widening gap is concentrated in the earliest publication cohorts. Removing the 2017 and 2018 cohorts jointly substantially attenuates the estimated effect, while the short-horizon estimate remains positive. The pattern therefore appears to characterize the program’s early public expansion rather than a uniform response across all recognition cohorts. Early recognition may have carried greater novelty, scarcity, and communication value, although the analysis cannot distinguish these mechanisms from differences in recipient composition or program implementation. The cohort concentration consequently defines an important scope condition for the findings.

The broader theoretical contribution is to frame environmental recognition as a question of cross-level alignment. Recognition is granted at the facility level, while disclosure and penalty-based compliance are observed at the listed-group level. Corporate communication may therefore convey an incomplete signal when its implied scope exceeds that of the underlying evaluation. Regulators can improve transparency by linking recognition to compliance records, while listed companies should clarify the scope of recognition. These implications remain subject to the limitations of penalty data and the concentration of H2 in the earliest cohorts. The resulting disclosure–compliance gap is illustrated in **Figure 3**.

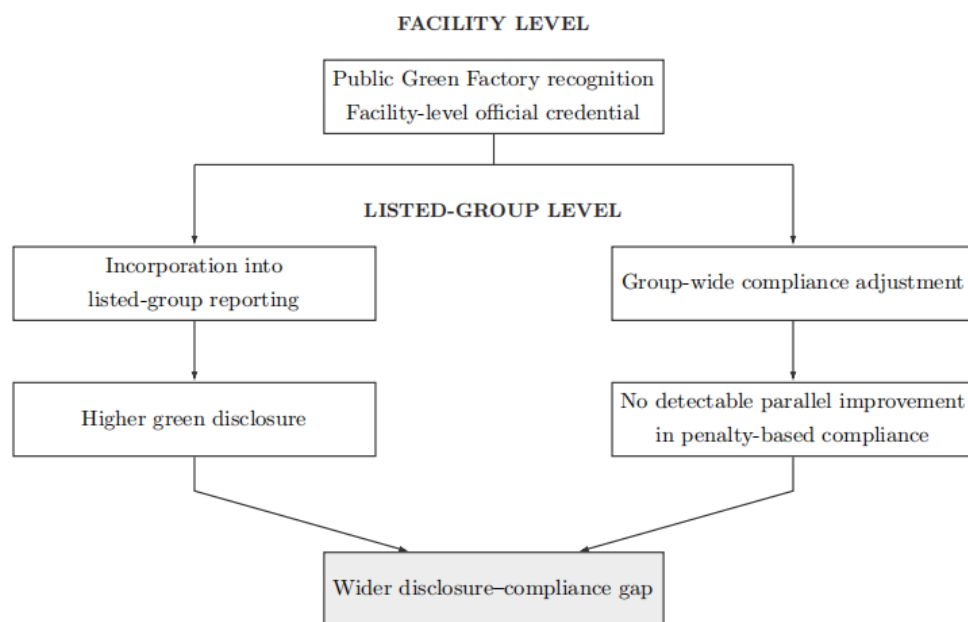


Figure 3. Cross-level pathways from Green Factory recognition to the disclosure–compliance

7. Conclusion

China’s National Green Factory program creates a public environmental identity at the production-facility level. This study examines how that identity is incorporated into listed-group reporting and whether green disclosure remains aligned with penalty-based compliance. Using a staggered-adoption design based on actual MIIT publication dates, we find that public recognition is associated with higher green disclosure and a wider

disclosure–compliance gap.

The findings reveal a cross-level consequence of environmental recognition. A credential attached to a specific facility can enter centralized group communication, whereas penalty-based compliance is observed across the parent and its controlled subsidiaries through administrative enforcement records. The widening gap is concentrated in the 2017 and 2018 publication-year cohorts, indicating that the relationship was most pronounced during the program’s early stage. This pattern does not establish deliberate greenwashing or a deterioration in total environmental performance. It shows that listed-group communication and penalty-based compliance did not move together after public recognition.

Effective governance of environmental recognition requires aligning the scope of the evaluated entity with the scope of subsequent corporate claims. Facility-level recognition remains informative, but it should not be treated as a complete measure of consolidated environmental performance. Reading official credentials alongside listed-group disclosure and administrative penalty records provides a more accurate basis for assessing what environmental recognition communicates—and what it does not.

Disclosure statement

The authors declare no conflict of interest.

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