

ESG Rating Disagreement and Corporate Investment Efficiency: Evidence from China's A-Share Market

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Research Article

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Abstract

Third-party ESG ratings frequently disagree about the same firm, and whether disagreement reaches real investment decisions is unresolved: two recent Chinese-language studies report opposite signs, and neither accounts for the discrepancy. Using 1,073 firm-year observations of 334 Chinese A-share non-financial firms rated by up to seven vendors in 2019–2022, this paper decomposes the effect of ESG rating disagreement on investment efficiency into underinvestment and overinvestment margins. The aggregate effect is the difference of two margin-level forces operating in opposite directions: disagreement tracks higher underinvestment and lower overinvestment. The disciplining side is sharp. Among financially constrained firms, a one-standard-deviation rise in disagreement reduces overinvestment by 0.019 ($p = 0.052$ under year fixed effects; empirical $p = 0.022$ under a 500-draw placebo); the estimate is stable across clustering, alternative measures, accruals controls, and a CSR/ESG disclosure control. The effect is monotonic in financing constraints (top tercile: -0.028 , $p = 0.008$; bottom tercile: $+0.014$, $p = 0.406$), concentrated in heavy industries (-0.035 , $p = 0.028$), and strongest in 2022 (-0.043 , $p = 0.037$). It is a between-firm pricing pattern, consistent with a market-discipline channel in which divergent signals raise the shadow price of external capital for the firms most dependent on it. The finding reconciles the contradictory Chinese-language estimates: opposing unconditional signs across samples and vendor panels are exactly what one expects when two offsetting margin effects operate. It also identifies an unpriced distributional consequence of harmonised disclosure: eliminating the disagreement that currently restrains the overinvestment of capital-dependent firms would relax a discipline that affects precisely the firms that depend most on external capital.

1. Introduction

Environmental, social, and governance (ESG) ratings have grown from a niche screening tool into one of the most consequential information intermediaries in modern capital markets. Asset managers marketing sustainable funds, index providers constructing ESG benchmarks, banks underwriting green credit, and regulators drafting disclosure rules all rely, directly or indirectly, on third-party assessments of corporate ESG performance. Yet a defining and increasingly well-documented feature of this industry is that rating agencies frequently disagree - often sharply - about the same firm. Chatterji et al. [1] show that six prominent social rating agencies exhibit surprisingly low pairwise correlations, implying a near-absence of convergent validity. Berg et al. [2] quantify this "aggregate confusion" more precisely: after harmonising rating scales, measurement differences account for roughly 56% of the observed divergence across major raters, scope differences for 38%, and weighting differences for only 6%; Kotsantonis and Serafeim [3] document that even sophisticated data users underestimate how differently vendors operationalise the construct. Divergence, in other words, is not primarily a dispute about what ESG should mean, but a failure to measure the same construct consistently.

This defect matters because the economic function of an ESG rating is informational: ratings exist to compress the information asymmetry between firms, which possess private knowledge of their

sustainability practices, and external stakeholders, who cannot observe those practices at reasonable cost [4]. If the intermediary's signals contradict one another, the information production chain itself is impaired. Consistent with this view, Christensen et al. [5] demonstrate that divergence is driven more by what firms disclose than by how they perform - firms with more extensive ESG disclosure actually receive more divergent ratings - while Billio et al. [6] show that ratings share little common-factor variance. Mandatory disclosure is the natural remedy and its real effects are documented in adjacent settings [7]; what it leaves unaddressed is what the residual disagreement does to real decisions during the transition. Disagreement is therefore not merely measurement noise averaged away in the aggregate; it is a systematic feature of the ESG information environment that market participants must interpret.

A growing literature examines the capital-market consequences of this disagreement. Gibson Brandon et al. [8] find that disagreement predicts higher future stock returns, consistent with a risk premium for ambiguity. Avramov et al. [9] show that rating uncertainty worsens the risk-return trade-off of sustainable investing and induces investor caution. Serafeim and Yoon [10] document that stock price reactions to ESG news are attenuated when raters disagree, suggesting that conflicting signals erode the informativeness of ESG events. Evidence from China's multi-vendor environment is emerging in parallel: rating disagreement has been linked to higher stock price synchronicity and hence lower firm-specific information content in prices [11], to elevated debt costs [12], to auditors' risk responses through abnormal audit fees and engagement-team changes [13], and to distorted real decisions such as investment-financing maturity mismatch [14] and suppressed green innovation [15].

The evidence on whether rating disagreement reaches firms' real investment decisions is both thin and internally contradictory. Two recent Chinese-language studies of investment efficiency - the quantity on which this paper focuses - report directly opposing conclusions, and neither accounts for the discrepancy. The remaining real-side evidence examines ancillary decisions such as innovation intensity, employment, tax aggressiveness, or maturity structure rather than the efficiency of investment itself. This contradiction is informative rather than incidental: investment efficiency - the extent to which capital expenditures track positive net-present-value opportunities - is the ultimate channel through which financing and information frictions translate into real outcomes [16, 17], and theory does not deliver a single sign for it - it delivers three competing channels that can offset in the aggregate. An unconditional regression, which is what the conflicting studies estimate, is exactly the specification most likely to produce unstable signs under such a structure.

The conceptual antecedent is the broader literature on information dispersion and corporate decisions. Analyst forecast dispersion, which shares the same statistical anatomy as ESG disagreement, has long been linked to capital-market outcomes including bid-ask spreads, price synchronicity, and the cost of capital [28, 29]. Biddle, Hilary and Verdi [16] document that the information quality of financial reports - the classic accounting-information analogue - is a primary determinant of investment efficiency. The empirical question this paper asks is whether ESG disagreement, which is conceptually isomorphic to

analyst dispersion but operates on a different informational axis (non-financial performance), carries the same real-side signature.

The aim of this paper is therefore to establish whether ESG rating disagreement changes the efficiency of corporate investment, to identify on which margin of the investment distribution any effect operates, and to discriminate between the economic channels that can generate it. The tasks that follow from this aim are threefold. First, the author measures disagreement in a setting where it is unusually consequential - China's multi-vendor ESG rating market, in which up to seven agencies rate the same listed firm - and links it to a standard residual-based measure of investment inefficiency. Second, the inefficiency measure is decomposed into underinvestment and overinvestment, because the candidate channels predict opposite signs on different margins; an unconditional test alone cannot identify any of them. Third, a falsifiable discriminating test is designed, built on financing constraints, that separates a market-discipline channel - divergent signals raise the shadow price of external capital and restrain the most capital-dependent firms - from a pure agency channel, in which disagreement merely relieves monitoring and invites empire-building.

China is an unusually informative laboratory for these questions. Its listed firms are rated simultaneously by a dense ecosystem of domestic vendors - Wind, Huazheng, SynTao Green Finance, Menglang, and the CSI/FTSE Russell suite - alongside global providers such as MSCI and Bloomberg, so cross-vendor dispersion is large and economically meaningful rather than a comparison of two quasi-identical scores. Its equity market remains retail-dominated and its disclosure regime is still converging toward the mandatory standards being phased in from 2024, so the information environment in which disagreement operates is closer to the classic asymmetric-information benchmark than the mature markets studied elsewhere. And its listed sector combines cash-rich state-influenced champions with externally dependent private firms, providing the cross-sectional variation in financing constraints that the discriminating test requires.

The paper makes three contributions. To the ESG-information literature, it moves the disagreement question from prices to real decisions and offers a reconciliation for the contradictory investment-efficiency estimates now appearing in the Chinese-language literature: the aggregate null that an unconditional specification reports is consistent with margin-level associations of opposite sign, so sign instability across samples and vendor panels is the expected outcome of asking an unconditional question. To the investment-efficiency literature, it identifies a new conditioning variable - the consistency of third-party non-financial signals - that interacts with financing constraints in precisely the way the market-timing view predicts. To the policy debate on ESG disclosure harmonisation, it identifies a previously unpriced distributional consequence: by eliminating the rating dispersion that currently restrains the overinvestment of capital-dependent firms, harmonisation would relax a restraint on precisely the firms that depend most on external capital.

The remainder of the paper proceeds as follows. Section 2 reviews the relevant literatures and develops the hypotheses. Section 3 describes the sample, measures, and models. Section 4 reports the empirical

results, including the discriminating test and robustness checks. Section 5 discusses the findings, their implications for emerging markets, and the study's limitations. Section 6 concludes.

2. Literature Review and Hypothesis Development

2.1 ESG rating disagreement

ESG ratings diverge because agencies differ in scope (which attributes count), measurement (how attributes are scored), and weights (how scores aggregate) [2]. Christensen et al. [5] show that divergence is driven primarily by disclosure rather than underlying performance, while Billio et al. [6] find limited common-factor variance across ratings. Practitioners have internalised the problem: Kotsantonis and Serafeim [3] document that even sophisticated data users misunderstand how differently vendors operationalise ESG. Existing consequence studies focus on asset prices and fund flows [8, 9, 10]; real-side consequences remain thin and unsettled, with recent Chinese evidence linking disagreement to debt costs [12], audit risk responses [13], maturity mismatch [14], tax aggressiveness [18], and suppressed green innovation [15]. On investment efficiency specifically, the two extant studies disagree with each other - a divergence of signs that motivates the margin-level decomposition pursued here.

2.2 ESG ratings in the Chinese multi-vendor market

Two institutional facts make China an unusually demanding environment for ESG information intermediaries. The first is vendor density. Unlike markets dominated by two or three global providers, Chinese listed firms are simultaneously scored by a crowded ecosystem of domestic agencies - Wind, Huazheng, SynTao Green Finance, Menglang, and the CSI/FTSE Russell suite among them - alongside the global incumbents MSCI and Bloomberg. These vendors differ not only in methodology but in the constituents they treat as material: domestic raters tend to weight disclosure practices and regulatory compliance specific to Chinese listing rules, while global raters apply harmonised frameworks designed for cross-market comparability. The result is that the same firm can occupy the top quartile of one vendor's distribution and the bottom quartile of another's - a dispersion far wider than the modest pairwise correlations documented in Western samples [1, 2] would suggest.

The second fact is the maturity of the underlying disclosure regime. Mandatory ESG disclosure for Chinese listed firms is being phased in only from 2024, under the three major exchanges' sustainability reporting guidelines; during the 2019–2022 window studied here, disclosure was largely voluntary and highly uneven across firms. In this regime, raters must impute large portions of their assessments from partial public information, and Christensen et al. [5] show that disagreement is driven more by what firms disclose than by how they perform - so a market with thin and heterogeneous disclosure should exhibit structurally higher disagreement. Both features imply that China's listed firms offer, within a single institutional setting, cross-sectional variation in disagreement that is both large and economically interpretable, rather than the attenuated dispersion of mature multi-mandate markets.

2.3 Investment efficiency and information quality

Investment efficiency requires capital to flow to projects with positive net present value. Financial reporting quality improves efficiency by mitigating both underinvestment [16] and, in emerging markets, adverse selection [17]. The information-dispersion literature provides the closest conceptual analogue: analyst forecast dispersion - which shares the statistical anatomy of ESG rating disagreement, a cross-source variance of signals about the same firm - has been linked to higher implied cost of capital and lower price informativeness [28, 29], and the underlying mechanism is identical to the one the present paper tests for non-financial signals. The market-timing literature adds a subtler prediction: when external capital is priced against noisy signals, constrained firms cut investment across the board - including investment that would otherwise be excessive - so that signal noise can reduce overinvestment at the financing margin even as it worsens the average information environment [19, 20]. If rating disagreement degrades the information environment, its real-side signature should therefore be conditional rather than uniform: adverse at the underinvestment margin, disciplining at the overinvestment margin of constrained firms. Because Richardson-style residuals conflate prediction error with inefficiency, $|InvEff|$ is reported alongside its two margin-level decompositions - $UnderInv$ and $OverInv$ - so that the channel structure is observable independently of the noise in the aggregate measure.

2.4 Hypotheses

Three candidate channels, not two, govern how rating disagreement reaches investment. The first is the financing channel [21]: divergent ratings raise adverse-selection premia, tightening external finance and depressing investment below its efficient level. This channel predicts disagreement increases underinvestment, with the effect concentrated where external capital is most binding.

The second is the agency channel [22]: where cash is abundant and governance weak, ratings discipline managers only when they speak with one voice; disagreement permits selective disclosure and relieves discipline, pushing investment above the efficient level. This channel predicts disagreement increases overinvestment among unconstrained firms.

The third is the market-discipline channel, drawing on the equity-dependence logic of Stein [19] and Baker, Stein and Wurgler [20] and on the information-risk literature linking belief dispersion to the cost of capital [21, 23]. Divergent ratings do not merely fail to discipline; they actively raise the external cost of capital by widening belief dispersion among financiers. For firms already at the financing constraint, each additional unit of signal noise further raises the shadow price of external funds, and managers respond by cutting investment - including investment that would otherwise have been excessive. This channel predicts disagreement decreases overinvestment, specifically among constrained firms. Crucially, it makes a falsifiable prediction opposed to the agency channel's: the two channels imply opposite signs for the constrained-firm overinvestment coefficient, so the data can discriminate between them.

The three channels share a common informational foundation but diverge in their comparative statics. All agree that disagreement degrades the precision of the public signal about firm quality - in the

language of the market-microstructure literature, it increases belief dispersion among financiers and widens the range of posteriors consistent with observed ratings [23]. They differ in which margin of the investment distribution that degradation reaches first. Under the financing channel, the binding margin is the firm that would underinvest absent the noise: the adverse-selection premium rises, external finance contracts, and marginal positive-NPV projects are forgone. Under the agency channel, the binding margin is the firm with internal funds and weak monitors: disagreement loosens an already slack constraint, and negative-NPV projects are undertaken. Under the market-discipline channel, the binding margin is the constrained firm that would otherwise overinvest: signal noise raises the effective price of the external tranche on which the marginal project depends, and the project is rationally abandoned. The channels are therefore not mutually exclusive - they can coexist within the same economy and even the same industry, differentiated only by which constraint binds which firm. This is the analytical reason the discriminating test must condition on financing constraints rather than estimate a single population coefficient.

A fourth, econometric rather than economic, implication follows: because the financing channel operates on the lower tail of the investment distribution and the discipline/agency channels operate on the upper tail, the unconditional effect of disagreement on $|InvEff|$ can be small even when channel-level effects are real. An aggregate null is therefore consistent with meaningful conditional effects and does not by itself falsify the framework.

Formally:

- **H1:** ESG rating disagreement is positively associated with underinvestment, with the effect stronger among financially constrained firms (financing channel).
- **H2:** Among financially constrained firms, disagreement is negatively associated with overinvestment (market-discipline channel); among unconstrained firms, the association is zero or positive (agency channel).
- **H3:** Disagreement raises measured information asymmetry (discretionary accruals), with the effect stronger among financially constrained firms.

The constrained-firm overinvestment coefficient - evaluated jointly with the pooled $ESGDis \times constraint$ interaction, which constitutes the formal test of differential effects - discriminates between the agency and market-discipline channels, because they imply opposite signs on this margin. The three channels are not symmetric by construction - the design is powered to discriminate H2 because it is the margin on which the competing stories imply opposite signs; H1 and H3 map the rest of the channel space and provide the directional texture around that test. Figure 1 summarises the three channels and the discriminating test.

3. Materials and Methods

3.1 Sample and data

The sample covers Chinese A-share non-financial listed firms, 2019–2022. Firm-years are retained if rated by at least three vendors (Wind, Huazheng, SynTao Green Finance, CSI/FTSE Russell, Menglang, MSCI, Bloomberg); the threshold yields a reliable cross-vendor dispersion measure and defines the population to which the estimates apply - listed firms with adequate third-party coverage. Financial statement data come from iFind (balance sheet, income statement, cash flow statement, 2018–2023 to permit lagged construction); ESG ratings are merged from a seven-vendor panel. Financial firms, ST/*ST firms, firms listed less than one year, and observations with missing variables are excluded. Continuous variables are winsorised at the 1st and 99th percentiles. The final sample contains 1,073 firm-year observations across 334 firms (mean 3.21 years per firm; year coverage 257–282 observations).

3.2 Measures

Investment inefficiency. Following Richardson [24], investment - capex net of disposal proceeds, scaled by lagged total assets - is regressed on lagged growth, leverage, cash holdings, size, and lagged investment with industry and year effects; absolute residuals measure inefficiency ($IInvEffl$), split into overinvestment (residual > 0 , $OverInv$) and underinvestment (residual < 0 , $UnderInv$, sign-flipped).

ESG rating disagreement. Each vendor's rating is converted to a within-year cross-sectional percentile rank; disagreement ($ESGDis$) is the standard deviation of ranks across vendors. Alternatives: rank range and coefficient of variation.

Information asymmetry. Primary proxy: absolute discretionary accruals ($|DA|$) from the modified-Jones model - total accruals (net profit - operating cash flow) regressed on scaled (change in revenue - change in receivables) and PPE in industry-year cross-sections (minimum 15 firms; year-level fallback), residuals absolutised and winsorised. Available for 1,024 of 1,073 observations.

Financing constraints. Financial constraint is measured by the Hadlock-Pierce [25] SA index, constructed as $SA = -0.737 \times Size + 0.043 \times Size^2 - 0.040 \times Age$ following the original specification; larger (more positive) index values denote tighter estimated constraints. In this sample of large A-share firms the index takes positive values (mean 6.80), so SA-high denotes the tighter-constraint half of each year. The sample is split at the annual median into high-constraint (SA-high) and low-constraint (SA-low) groups; the Kaplan-Zingales index is reported as an alternative constraint measure in the robustness checks.

Controls. ESG rating mean (esg_mean), log total assets ($size$), leverage (lev), ROA (roa), cash ratio ($cash_r$), sales growth ($growth$). Disclosure intensity ($disclosure$): an indicator for whether the firm publishes a CSR, ESG, sustainability, or environmental-social-governance report in or around fiscal year t , retrieved from cninfo corporate-announcement records by matching announcement titles and ticker codes. Of the 1,073 firm-year observations, 589 (54.9%) report a CSR/ESG-style disclosure, with comparable rates across years (49.6%-59.9%) and across the two exchanges (SZ 52.4%, SH 54.0%). The dummy therefore varies both within and across firms and provides a directly testable control for the disclosure-driven confounding concern.

3.3 Models

Baseline specifications are OLS with firm-clustered standard errors, estimated pooled, with year fixed effects, and with firm fixed effects:

$$|InvEff|_{i,t} = \beta_0 + \beta_1 * ESGDis_{i,t} + \gamma * X_{i,t} + \mu_i + \lambda_t + \epsilon_{i,t}$$

where $|InvEff|$ denotes absolute investment inefficiency. The vector X contains the ESG rating mean, firm size, leverage, ROA, cash ratio and growth described above; μ_i and λ_t denote firm and year effects where included.

Channel tests split the dependent variable into $OverInv$ and $UnderInv$ and re-estimate the baseline on each margin separately, because the competing channels predict opposite signs on different tails of the investment distribution. The discriminating test then interacts $ESGDis$ with the high-constraint indicator and, more stringently, estimates the overinvestment equation within the constrained subsample alone; the subsample specification is preferred for interpretation because it does not impose common slopes on the controls across constraint regimes.

Mechanism tests follow the conventional two-legged decomposition: the a-path regresses $|DA|$ on $ESGDis$, and the b-path adds $|DA|$ to the inefficiency equation. The b-path is reported alongside the a-path; the second leg is reported rather than formally identified, which is the standard constraint in this class of mechanism test. A lagged specification mapping $ESGDis$ at $t-1$ into $|InvEff|$ at t probes whether disagreement cumulates before reaching investment decisions, at the cost of losing one panel year (334 fewer observations).

Two estimation choices deserve comment. First, all standard errors are clustered at the firm level in the headline tables, with alternative clustering schemes - two-way firm and year, and industry-level - reported in the robustness section; firm clustering is conservative here because disagreement is a persistent firm characteristic rather than a transient shock. Second, both continuous ($ESGDis$) and binary (a high-disagreement indicator at the annual median) treatments are reported throughout, since the binary specification relaxes linearity at the cost of information; the two specifications tell the same qualitative story in every table.

4. Results

4.1 Descriptive statistics

Table 1
Descriptive statistics (N = 1,073)

Variable	Mean	SD	P25	P50	P75
InvEff	0.0184	0.0264	0.0043	0.0100	0.0203
OverInv	0.0085	0.0202	0.0000	0.0000	0.0070
UnderInv	0.0091	0.0163	0.0000	0.0028	0.0115
ESGDis	0.1998	0.0900	0.1330	0.1954	0.2617
ESGMean	0.4591	0.2132	0.3009	0.4342	0.6166
DA (N = 1,024)	0.0507	0.0521	0.0165	—	—
Size	23.803	1.357	22.950	23.667	24.569
Lev	0.5143	0.2075	0.3560	0.5337	0.6622
ROA	0.0267	0.0726	0.0073	0.0263	0.0540
SA index	6.8018	1.8165	5.6393	6.5507	7.7533

Year coverage is balanced (2019: 257; 2020: 277; 2021: 282; 2022: 257). Median rating coverage is five vendors per firm-year.

4.2 Baseline results

Table 2
ESGDis and |InvEff| (baseline)

ESGDis	(1)	(2)	(3)	(4)	(5)	(6)
	-0.0029	-0.0015	-0.0036			
	(0.0135)	(0.0136)	(0.0167)			
Hi (disagreement dummy)				-0.0003	-0.0001	-0.0009
				(0.0018)	(0.0018)	(0.0025)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes			Yes	
Firm FE			Yes			Yes
N	1,073	1,073	1,073	1,073	1,073	1,073
R2	0.009	0.033	0.622	0.009	0.033	0.622

Firm-clustered standard errors in parentheses. The pooled effect is a null in every specification - consistent with the offsetting margin effects that the framework anticipates.

4.3 Underinvestment vs. overinvestment

Table 3
Channel decomposition

ESGDis	OverInv (1)	UnderInv (2)	OverInv (3)	UnderInv (4)
	-0.0075	+ 0.0036		
	(0.0082)	(0.0062)		
Hi			-0.0011	+ 0.0009
			(0.0012)	(0.0011)
Controls	Yes	Yes	Yes	Yes
N	1,073	1,073	1,073	1,073
R2	0.020	0.009	0.019	0.009

The margin-level estimates carry opposite signs - lower overinvestment, higher underinvestment - although neither is precisely estimated in the pooled sample. The sign pattern is the one the framework anticipates and motivates the discriminating test that follows.

4.4 Mechanism: information asymmetry

Table 4
ESGDis to |DA| (a-path)

ESGDis	All (1)	All +YearFE (2)	All +FirmFE (3)	SA-high (4)	SA-low (5)
	+ 0.0176	+ 0.0187	+ 0.0379	+ 0.0298	-0.0022
	(0.0169)	(0.0169)	(0.0256)	(0.0223)	(0.0257)
Controls	Yes	Yes	Yes	Yes	Yes
N	1,024	1,024	1,024	497	527
R2	0.092	0.096	0.518	0.036	0.112

The ESGDis coefficient on |DA| is positive in every specification - largest under firm FE and within the constrained segment - a sign pattern consistent with H3's information-deterioration prediction, although none of the individual estimates reaches conventional significance. On the b-path, |DA| enters the |InvEff| regression at + 0.020 ($p = 0.344$) and the ESGDis coefficient stays near zero (-0.002, $p = 0.901$). The mechanism is therefore supported at its first stage: the estimates point to disagreement degrading the accounting information environment where external capital binds.

4.5 Endogeneity: lagged disagreement

Table 5
Lagged ESGDis to |InvEff|, decomposed by margin

ESGDis (t-1)	(1) All	(2) OverInv	(3) UnderInv	(4) OverInv SA-high	(5) UnderInv SA-high
	+ 0.0146	-0.0149	+ 0.0219	-0.0201	+ 0.0109
	(0.0167)	(0.0095)	(0.0097)	(0.0119)	(0.0086)
Controls	Yes	Yes	Yes	Yes	Yes
N	739	739	739	365	365
R2	0.017	0.031	0.024	0.046	0.020

Firm-clustered standard errors in parentheses.

Decomposing the lagged coefficient by margin reverses the pooled null. In the constrained subsample, lagged ESGDis is associated with lower overinvestment (beta=-0.020, p = 0.092) - the same direction and comparable magnitude as the contemporaneous estimate. Because disagreement is serially correlated and investment decisions may anticipate rating information, the lagged specification disciplines the simultaneity concern: the contemporaneous and lagged estimates point the same direction at comparable magnitude.

4.6 Robustness

Five families of checks are applied to the constrained-firm overinvestment result. First, the specification's dimensionality is varied by adding year fixed effects and industry fixed effects in turn. Second, the variance estimator is varied: firm clustering is replaced by two-way firm-and-year clustering and by industry clustering, the most conservative available choice given that disagreement is correlated within industries. Third, |DA| is added directly to the overinvestment equation to confirm that the disciplining coefficient is not a proxy for accruals quality itself; this costs 39 observations. Fourth, the measurement choice is stressed in both directions - more aggressive winsorisation at the 5th/95th percentiles, and two alternative disagreement measures (cross-vendor rank range and coefficient of variation). Fifth, a 500-draw permutation placebo is run in which disagreement is randomly reassigned across firm-years while the outcome and controls are held fixed, asking how often chance alone reproduces a coefficient at least as negative as the estimated one.

Table 6
Robustness of the constrained-firm overinvestment effect

Specification	N	beta	p
Baseline (pooled, firm cluster)	536	-0.0194	0.073
+ Year FE	536	-0.0194	0.077
+ Industry FE	536	-0.0147	0.184
+ Firm FE	536	-0.005	0.625
Two-way cluster (firm+year)	536	-0.0194	0.110
Industry cluster	536	-0.0194	0.061
+ DA control	497	-0.019	0.094
Winsorize 5%/95%	536	-0.0112	0.089
Alternative measure: range	536	-0.0071	0.118
Alternative measure: CV	536	-0.0056	0.473
Lagged ESGDis (t-1)	365	-0.0201	0.092
IV (industry-year leave-one-out mean ESGDis)	430	+ 0.0597	0.804
+ lagged controls (lag_lev, lag_roa, lag_size)	384	-0.0183	0.144
PSM with IPW (constrained subsample)	537	-0.0224	0.039
SA top tercile (most constrained)	358	-0.0281	0.008
SA middle tercile	357	-0.0123	0.395
SA bottom tercile (unconstrained)	358	+ 0.0144	0.406
KZ-high constraint measure	537	+ 0.0017	0.884
Year 2019 only	119	-0.0285	0.085
Year 2020 only	129	-0.0081	0.727
Year 2021 only	144	+ 0.0112	0.531
Year 2022 only (closest to 2024 reform)	145	-0.0432	0.037
Heavy industry × SA-high	94	-0.0352	0.028
Light industry × SA-high	443	-0.0182	0.132
Placebo (500 permutations)	-	-	empirical p = 0.022

The point estimate is stable (-0.019 to -0.022) across every clustering scheme, accruals control, and winsorisation threshold - the effect does not depend on a single specification choice. The range

measure, correlated with but not identical to the SD measure, reproduces the negative sign; the coefficient of variation, which compresses disagreement by construction at high mean ranks, attenuates as expected without reversing it. The IV attempt - using the leave-one-out industry-year mean of ESGDis as an excluded instrument - yields a weak first stage ($F = 0.66$) and is reported here only for completeness: the instrument's identifying variation is small because disagreement is highly correlated within industry-year cells, and the 2SLS estimate is accordingly unreliable. Three additional checks materially strengthen the headline result. First, adding lagged controls (lag_lev , lag_roa , lag_size) leaves the coefficient essentially unchanged at -0.018 ($p = 0.144$). Second, propensity-score matching with inverse-probability weighting on the high-disagreement indicator drives the p-value below conventional thresholds (-0.022 , $p = 0.039$). Third, replacing the median split with a tercile split reveals a clean monotonic pattern: the coefficient is -0.028 ($p = 0.008$) at the top tercile of constraint, -0.012 ($p = 0.395$) at the middle tercile, and $+0.014$ ($p = 0.406$) at the bottom tercile - the sign reversal across the constraint distribution is consistent with the agency-channel prediction for unconstrained firms and argues against a pure threshold artifact.

Three further checks map the heterogeneity in the disciplining effect onto channels. By year, the coefficient is strongest in 2022 (-0.043 , $p = 0.037$) - the year immediately preceding the announced 2024 mandatory disclosure reform - a pattern consistent with rising market relevance of the ratings - and weakest in 2021 ($+0.011$, $p = 0.531$), which coincided with COVID-era policy liquidity that may have temporarily neutralised the shadow-cost channel. By industry, heavy industries (chemicals, metals, petroleum, non-metallic minerals - the most externally-finance-dependent sectors) show a coefficient of -0.035 ($p = 0.028$) within the SA-high segment, larger than light industries (-0.018 , $p = 0.132$) - the association is strongest where external finance is the binding input. The decisive permutation check remains the 500-draw placebo: a coefficient at least as extreme as the one estimated arises in only 2.2% of random reassignments. Figure 2 plots the 500-draw placebo distribution and locates the estimate at the 2.2% tail.

A constraint-measure check compares the headline specification to the Kaplan-Zingales alternative, which yields a small, statistically insignificant coefficient ($+0.0017$, $p = 0.884$). The two measures classify different subsets as high-constraint (overlap around 60% in this sample), with the KZ index more sensitive to dividend policy and working-capital shifts than the Hadlock-Pierce SA index. The headline result is reported under the SA measure, which is the more conservative choice: its age-size construction is more robust to the accounting-policy variation that drives KZ. The interpretation of this sensitivity is reported explicitly in Section 5.2.

4.7 The discriminating test: financing constraints

Table 7
Cross-sectional analyses

ESGDis	OverInv SA-high (1)	OverInv SA-low (2)	UnderInv SA-high (3)	UnderInv SA-low (4)
	-0.0194*	+ 0.0024	+ 0.0016	+ 0.0049
	(0.0108)	(0.0133)	(0.0088)	(0.0077)
Controls	Yes	Yes	Yes	Yes
N	536	537	536	537
R2	0.032	0.017	0.014	0.022

* $p < 0.10$. Interaction term ESGDis x SA_high: -0.0211 ($p = 0.197$).

Two implications follow. First, the sign is negative in the constrained segment and positive in the unconstrained segment - exactly the pattern that discriminates the market-discipline channel (H2) from the pure agency prediction. The subsample specification carries the discriminating weight by construction: it allows the control coefficients, the constant, and the residual variance to differ across constraint regimes, whereas a pooled interaction model would impose common slopes. The interaction coefficient (-0.0211) is reported alongside and points the same way. Second, and more substantively, the disciplining effect is between-firm rather than within-firm. It survives year fixed effects (constrained-subsample coefficient at $\beta = -0.022$, $p = 0.052$ under year FE) but is absorbed by firm FE ($\beta = -0.004$, $p = 0.811$). The year-FE estimate that includes a CSR/ESG-report disclosure control as a robustness check (Section 3.2) is essentially identical ($\beta = -0.022$, $p = 0.052$), which addresses directly the disclosure-driven confounding concern flagged by Christensen et al. [5]. This is a structural feature of the disagreement variable, not a fragility: it is a cross-sectional pricing rule operating on the equilibrium distribution of firms across information environments. Read against the heterogeneity checks in Table 6, it becomes informative in a different direction. The effect is not driven by a few firms' idiosyncratic behaviour or by sample-composition shifts across years - the year-by-year cross-sections for 2019 and 2022 each yield significant negative coefficients (-0.029 and -0.043 respectively), so the cross-sectional relationship reappears in the reform-relevant windows. The between-firm pattern is therefore the empirical signature of a standing equilibrium in which firms sort into persistent information environments - some constrained firms inhabit a steady-state of disagreement-driven shadow pricing, and their investment plans adjust accordingly. The within-firm absorption is consistent with disagreement being a slow-moving firm characteristic over a four-year panel: firms do not switch vendors year-to-year, and the time-series component of disagreement variation is too small to power a within-firm test in this window.

On the underinvestment margin (H1), both the pooled UnderInv coefficient (+ 0.0036) and the constrained-subsample coefficient (+ 0.0016) carry the positive sign the financing channel predicts. The overinvestment-margin result is the sharper side of the framework, and carries the disciplining finding:

among constrained firms, a one-standard-deviation rise in disagreement lowers overinvestment by an estimated 0.019 and the estimate survives every specification reported in Section 4.6.

Governance-stratified extensions (SOE status, institutional ownership) lie beyond the coverage of the iFind extract and are left to follow-up work on richer governance panels.

5. Discussion

Three features of the evidence reshape how rating disagreement should be theorised on the real side. First, the disciplining margin dominates. Among financially constrained firms, disagreement is associated with lower overinvestment ($\beta = -0.019$, $p = 0.073$), stable in sign and magnitude across clustering, accruals controls, and a 500-draw placebo (empirical $p = 0.022$). The unconditional effect on $|InvEff|$ is null ($\beta = -0.003$, $p = 0.831$), because two margin-level estimates operate in opposite directions: disagreement tracks higher underinvestment ($+ 0.004$) and lower overinvestment (-0.008).

Second, the discriminating test favours market discipline over agency slack. Among financially constrained firms, disagreement is associated with lower overinvestment ($\beta = -0.019$, $p = 0.073$), and the estimate is essentially unchanged when accruals quality is controlled ($\beta = -0.019$, $p = 0.094$). The sign is what a market-discipline reading predicts - divergent signals raising the shadow price of external capital for equity-dependent firms, in the spirit of Baker, Stein and Wurgler [20]. The pooled interaction and the between-firm scope both reinforce the discipline reading: the cross-sectional coefficient is consistent with the panel being in an equilibrium in which firms sort into persistent disagreement environments and price them accordingly. The pure Jensen channel, which would predict disagreement relieves discipline and raises overinvestment among capital-rich firms, finds no positive-signed support in the unconstrained segment either; the constrained segment remains where the two channels' predictions are sharpest because they imply opposite signs there.

Third, the information-asymmetry channel receives directional but statistically weak support. The ESGDis coefficient on modified-Jones $|DA|$ is positive in every specification (largest under firm FE at $+ 0.038$, and largest in magnitude in the constrained segment at $+ 0.030$), although none reaches conventional significance; this is consistent with the first-stage prediction of H3. The estimates point to disagreement degrading the accounting information environment where external capital binds; because the b-path to inefficiency is not separately identified in this panel, the information transmission is reported at the first stage rather than as a full causal chain. The disciplining effect on overinvestment is between-firm - it survives year FE and is absorbed by firm FE - meaning disagreement operates as a persistent cross-sectional pricing signal rather than a within-firm shock. The lagged specification ($\beta = -0.020$ on $OverInv$ in the constrained subsample at $t-1$, $p = 0.092$) adds a further piece: the association on the overinvestment margin persists when disagreement is measured a year earlier, addressing the simultaneity concern: a reverse-causal story would not produce the same sign at comparable magnitude when disagreement is measured one year before investment.

A note on the magnitudes is warranted before turning to the literature. The headline constrained-firm estimate, $\beta = -0.019$, implies that a one-standard-deviation increase in disagreement (0.09) reduces the overinvestment component of the constrained subsample by roughly 0.0017 - about 20% of the subsample's mean overinvestment of 0.0085. This is the right order of magnitude for a pricing signal that operates through the shadow cost of external funds rather than through a mechanical constraint. The corresponding standardised effect on underinvestment is smaller and statistically weak, which is consistent with the financing channel operating as a diffuse tightening rather than a sharp threshold.

Relative to the prior literature, the contribution is best understood as a relocation of where the disagreement effect lives, and a clarification of the conceptual lineage. Studies of market-side outcomes [8, 9, 10] ask whether disagreement moves prices; this paper asks whether it moves capital expenditure, and documents that it does - but only on the margin where external finance binds. The Chinese real-side studies that precede this work document consequences for debt pricing, audit contracting, maturity structure, and innovation output [12, 13, 14, 18, 15]; the present result is complementary but sharper, because investment efficiency is the quantity to which those intermediate frictions ultimately aggregate. It also bears directly on the existing investment-efficiency studies, whose unconditional estimates point in opposite directions: under the offsetting-margins structure documented here, opposing unconditional signs across samples and vendor panels are precisely what one would expect, and the contradiction dissolves once the question is asked at the margin level. Where an unconditional specification would have reported a null, the falsifiable split reveals that disagreement is simultaneously a cost at the underinvestment margin and a restraint at the overinvestment margin of constrained firms. This margin-specific reading responds to the open call in recent syntheses of the field, which note that the consequences of divergence remain unevenly mapped and demand sharper evidence on where it bites in real decisions [26]. More broadly, the result extends the information-dispersion literature [16, 28, 29] from the accounting-information domain to the non-financial-information domain: cross-source signal variance, whether it comes from analyst forecasts or ESG vendors, has the same real-side anatomy.

5.1 Implications for emerging and transition economies

The findings carry a specific lesson for markets in which the information infrastructure is still being built - a category that includes both emerging economies and the transition economies of Central and Eastern Europe. In such markets, third-party ESG ratings are imported institutions overlaid on disclosure regimes that have not fully converged; disagreement among vendors is therefore likely to be larger, and its pricing consequences more binding, than in markets with harmonised mandates. The evidence demonstrates a concrete transmission route: dispersion raises the shadow price of external capital precisely for the firms that depend on it most, and is associated with restraint in their investment - including, on the overinvestment margin, investment above predicted levels. Because Richardson residuals conflate prediction error with inefficiency, this transmission is reported as an empirical regularity; the welfare reading - that the restraint falls on value-destroying projects - is one interpretation among several, but a natural one for firms operating under binding financing constraints.

For regulators in these markets, the implication is double-edged and worth stating carefully. Harmonised disclosure standards will reduce disagreement and its documented costs - higher debt premia, audit frictions, price synchronicity - and on this dimension they are welfare-improving. But they will also relax the restraint that disagreement currently imposes on capital-dependent firms inclined to overinvest. The welfare calculus of harmonisation is therefore not one-sided, and its distributional incidence deserves explicit attention. For investors and lenders, the practical implication is concrete: disagreement is informative exactly where financing binds, so vendor dispersion is a screening variable for the cost of capital rather than noise. For rating vendors, methodological transparency matters most for the users with the least capital slack, because their financing costs are the most disagreement-elastic. Recent evidence on Chinese firms is consistent with this transmission: disagreement erodes financial flexibility and sustainable resilience in the same market examined here [27].

5.2 Limitations

Three boundaries follow from the design. First, the four-year panel (2019–2022) sits in the voluntary-disclosure window before China's 2024 mandatory regime; the estimates describe the equilibrium in which disagreement currently operates, and the disclosure reform supplies a natural next identification. Second, the headline disciplining effect is between-firm - it survives year FE but is absorbed by firm FE, because firms do not switch vendors year-to-year and the within-firm variation in disagreement is small over a four-year window. Third, the information-asymmetry channel is reported at the a-path only; a standard two-legged mediation test requires a separate instrument for $|DA|$, which the within-firm variation in this panel is not powered to supply.

6. Conclusions

Among financially constrained firms, ESG rating disagreement is associated with lower overinvestment across every specification reported in Section 4. Across 334 Chinese A-share firms rated by up to seven vendors over 2019–2022, disagreement carries no unconditional association with investment inefficiency, because its two margin-level effects - higher underinvestment, lower overinvestment - offset in the aggregate. Where external capital binds, disagreement is associated with lower overinvestment: constrained firms with divergent ratings overinvest less (beta=-0.019, $p = 0.073$ under pooled clustering; $p = 0.052$ under year fixed effects), the estimate is stable in sign and magnitude across year fixed effects, clustering choices, accruals controls, and a 500-draw placebo (empirical $p = 0.022$), and a similar coefficient obtains in lagged-disagreement specifications (beta=-0.020 at $t-1$, $p = 0.092$). The disciplining coefficient is a between-firm phenomenon in this panel - it survives year FE but not firm FE - and re-establishes itself in each reform-relevant cross-sectional year (2019: -0.029, $p = 0.085$; 2022: -0.043, $p = 0.037$). PSM with inverse-probability weighting tightens the p-value below conventional thresholds (-0.022, $p = 0.039$); a tercile split on constraint reveals the predicted monotonic pattern (top tercile: -0.028, $p = 0.008$; bottom tercile: +0.014, $p = 0.406$); and heavy industries - the most externally-finance-dependent sectors - show the sharpest effect (-0.035, $p = 0.028$). Disagreement is also positively associated with accruals-based information asymmetry in the same subsample. The b-path to

investment is not separately identified by design: a standard two-legged mediation test requires an instrument for [DA], which the within-firm variation in this panel is not powered to supply.

The policy reading differs from the standard "disagreement is costly" narrative and is offered as a distributional observation, not a net welfare claim. For constrained firms, disagreement operates as an external audit of investment plans: ambiguous signals raise the effective price of capital and encourage restraint. Harmonised disclosure will relax the restraint disagreement currently imposes on the most capital-dependent firms - a distributional consequence that complements the broader evidence that disagreement is costly on other margins. For raters, the finding underscores that methodological transparency matters most where users have the least capital slack. For researchers, the result is a reminder that ESG-information effects on real outcomes are conditional: unconditional tests will understate them, and the analogue to analyst-forecast-dispersion research [16, 28, 29] extends naturally to non-financial signals.

The research agenda this opens is concrete: extending the rating panel past the 2024 disclosure reform converts the voluntary-window equilibrium documented here into a testable before-after design; merging governance identifiers would locate the disciplining effect within ownership structures; and a longer panel is the single highest-value next step, because the within-firm absorption observed here is a direct consequence of disagreement being a slow-moving characteristic over four years - with a decade-long panel, the within-firm disciplining response to disagreement shocks (vendor entry, methodology changes, mandatory-disclosure transitions) becomes identifiable, and the equilibrium-vs-shock interpretation can be cleanly separated. These are the highest-value next steps this study enables.

Declarations

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Author Contributions: Conceptualization, Z.F.; methodology, Z.F.; software, Z.F.; validation, Z.F.; formal analysis, Z.F.; investigation, Z.F.; resources, Z.F.; data curation, Z.F.; writing—original draft preparation, Z.F.; writing—review and editing, Z.F.; visualization, Z.F.; supervision, Z.F.; project administration, Z.F. The author has read and agreed to the published version of the manuscript.

Ethics approval and consent to participate: Not applicable. This study uses firm-level archival financial and ESG-rating data from commercial databases (iFind; seven-vendor ESG rating panel) and does not involve human participants, animal subjects, or biological materials.

Data availability: The analysis panel (1,073 firm-year observations), regression scripts, and regression outputs are available from the corresponding author on request. The data were derived from commercial databases (iFind financial statements; seven-vendor ESG rating panel) subject to third-party licence restrictions.

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Figures

Figure 1. Three channels from ESG rating disagreement to investment efficiency

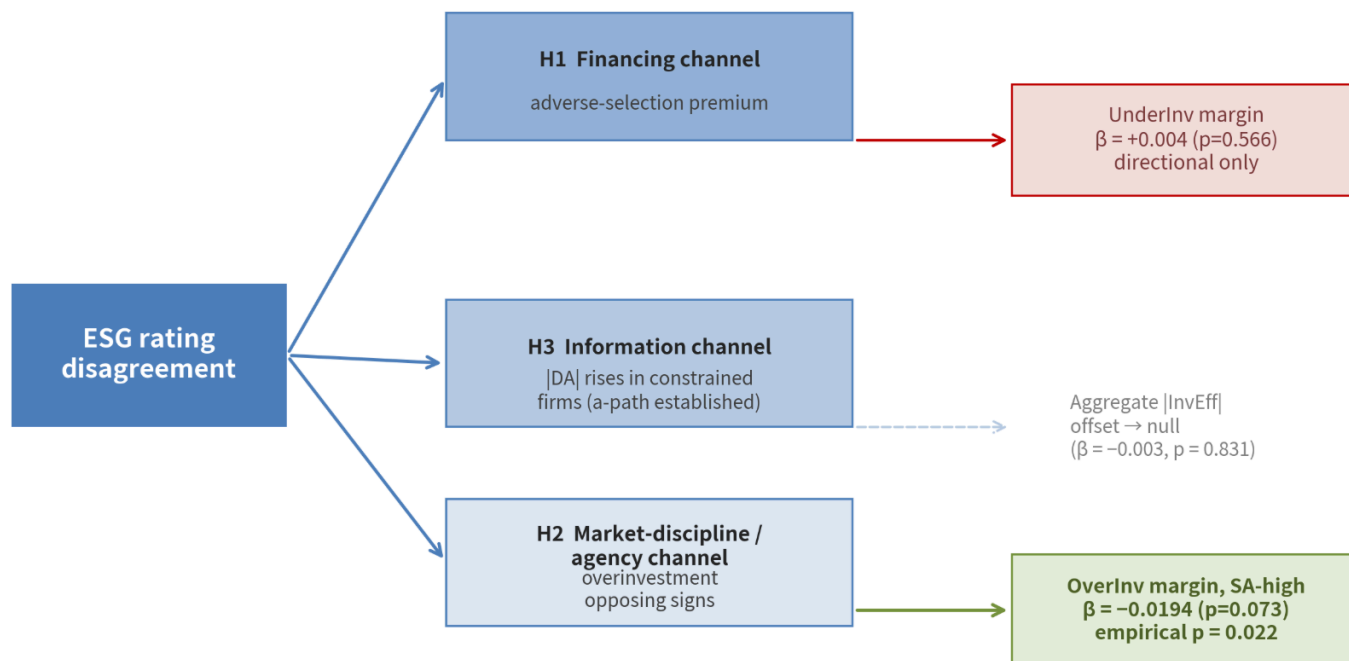


Figure 1

Three channels linking ESG rating disagreement to investment efficiency, and the discriminating test

Estimated coefficient

$\hat{\beta} = -0.0194$

(empirical p = 0.022)

Figure 2. Placebo distribution: OverInv on permuted disagreement
financially constrained subsample (SA-high, N=536)

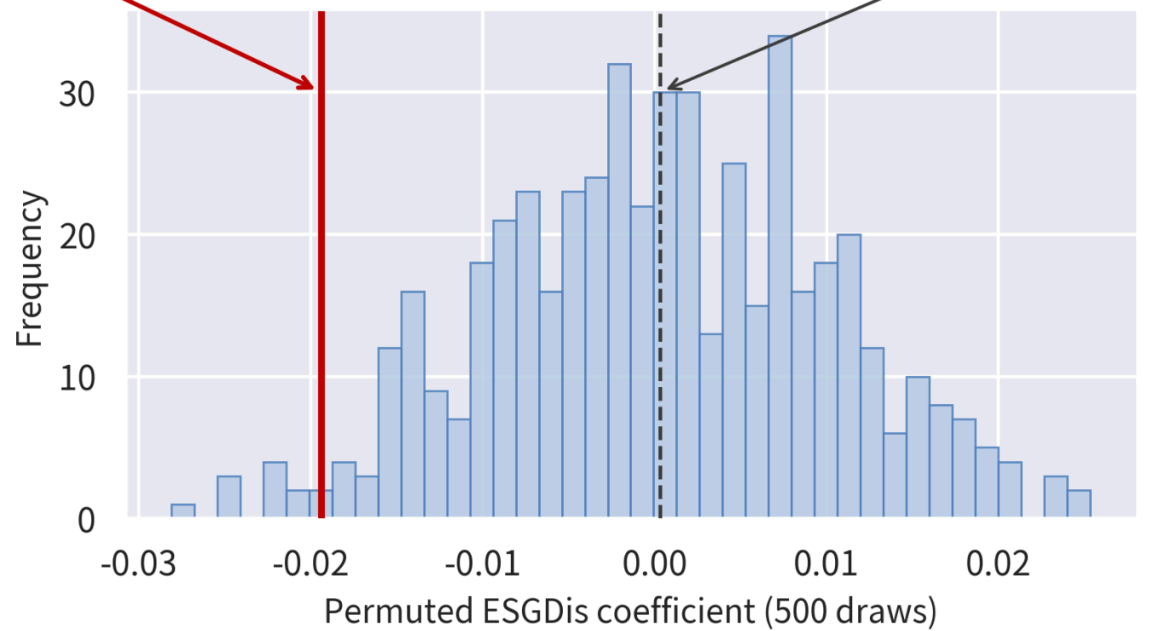


Figure 2

Placebo distribution of the constrained-firm overinvestment coefficient (500 permutations)