Original Research Article

Negative green innovation feedback and M&A deal termination risk in China

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Abstract: This study examines whether negative green innovation performance feedback affects the resolution of announced mergers and acquisitions (M&A). Drawing on performance feedback theory, it argues that underperformance in green innovation can heighten managerial urgency during the post-announcement stage of a deal. In friction-laden transactions, however, such urgency may not speed completion; instead, it may intensify valuation, financing, due diligence, and regulatory problems. Using 36,316 announced M&A deals by Chinese A-share listed firms from 2010 to 2022, this paper applies Cox and cause-specific hazard models to deal duration data. The results show that negative green innovation performance feedback is not robustly associated with faster deal completion once controls are included, but is positively associated with a higher hazard of deal termination or withdrawal. The findings suggest that green innovation underperformance is more strongly associated with execution risk than with faster completion among already announced deals.

Keywords: green innovation; performance feedback; mergers and acquisitions; deal termination; China

1. Introduction

Green innovation has become a strategic concern for firms facing intensifying environmental expectations. In China, the green transition has increased the pressure on listed firms to strengthen their environmental capabilities and demonstrate technological progress. When a firm falls behind its industry peers in green innovation, managers may face pressure to close the gap quickly. One possible response is to pursue mergers and acquisitions in order to obtain external knowledge, green technologies, or complementary assets. Yet an announced acquisition is only the start of a longer process. Many deals encounter obstacles after announcement and some are ultimately terminated or withdrawn.

This paper studies whether negative green innovation performance feedback affects the post-announcement resolution of M&A deals. The focus is deliberately conditional on deal announcement. Rather than explaining why firms decide to launch acquisitions, the paper asks whether green innovation underperformance changes the way already announced transactions unfold. This distinction matters because the execution stage of M&A is shaped by negotiation, due diligence, financing arrangements, and regulatory review. Pressure that motivates strategic action may therefore have different consequences once a deal enters implementation.

Using 36,316 announced M&A transactions by Chinese A-share listed firms from 2010 to 2022, the analysis models deal duration from first announcement to final resolution. The evidence shows a clear asymmetry. Negative green innovation feedback is not robustly associated with faster deal completion once firm- and deal-level controls are introduced, but is positively associated with a higher hazard of deal termination or withdrawal. The main contribution of the paper is to show that green innovation underperformance is linked less to faster strategic adjustment than to greater execution risk in the resolution stage of M&A.

2. Theory and hypothesis

Performance feedback theory argues that firms compare actual outcomes with aspiration levels and respond when performance falls short of salient benchmarks (Cyert & March, 1963; Greve, 2003). In the setting of green innovation, industry peers provide a particularly relevant benchmark because firms within the same industry face similar technological trajectories, environmental expectations, and market comparisons. When a firm underperforms relative to this benchmark, decision makers may engage in

problemistic search and seek corrective action. M&A can become an attractive instrument because it promises rapid access to technologies and capabilities that are difficult to build internally.

However, pressure does not automatically improve execution. Announced M&A deals move through a post-announcement stage that is uncertain and friction laden (Jemison & Sitkin, 1986). The acquirer must complete due diligence, negotiate valuation and payment terms, secure financing, coordinate with counterparties, and satisfy regulatory requirements. Under strong pressure to catch up in green innovation, managers may become overly aggressive in target evaluation, accept less favorable terms, compress due diligence, or overestimate the feasibility of approval. In that case, urgency does not translate into efficiency; instead, it increases the chance that execution frictions accumulate and the deal is withdrawn or terminated.

Accordingly, this paper proposes the following hypothesis: Negative green innovation performance feedback is associated with a higher hazard of deal termination or withdrawal among announced M&A transactions.

3. Data and method

The sample consists of 36,316 announced M&A transactions by Chinese A-share listed firms between 2010 and 2022. M&A transaction data, financial variables, and governance characteristics are drawn from CSMAR and WIND, while green innovation measures are taken from CNRDS and cross-checked against CNIPA records. The unit of analysis is the individual announced deal. Deal duration is measured as the number of days from the first announcement date to the final resolution date. Deals that remain unresolved by 31 December 2022 are treated as right-censored.

The dependent outcomes are completion and termination or withdrawal. The main explanatory variable is negative green innovation performance feedback, constructed as shown in Equations (1) and (2), where $Cite_{it}$ is the focal firm's forward citations to green invention patents and $Cite_{jt}^{ind}$ is the industry average in the same year.

The downside gap is defined as follows:

$$\text{DownsideGap}_{it}=\max\left(Cite_{jt}^{ind}-Cite_{it},0\right) \quad (1)$$

The logged measure used in the regressions is then defined as follows:

$$\ln NegPressure_{it}=\ln\left(1+DownsideGap_{it}\right) \quad (2)$$

where $Cite_{it}$ denotes the focal firm's forward citations to green invention patents in year t, and $Cite_{jt}^{ind}$ denotes the industry-average value in year *t*. Equation (1) captures downside deviation from the industry benchmark, and Equation (2) transforms the downside gap into the logged measure used in the regressions. The measure captures downside deviation from an industry-based aspiration level and is lagged by one year. Control variables include firm size, leverage, return on assets, operating cash flow, firm age, deal value, a missing-value indicator for deal value, and payment method. Year and industry fixed effects are included, and standard errors are clustered at the firm level.

Table 1. Descriptive statistics of main variables.

Variables	Obs.	Mean	SD	25th Pctl.	Median	75th Pctl.
Deal duration (days)	36,316	1039.153	1029.061	139.000	654.500	1733.500
Negative green innovation feedback	36,316	2.352	1.655	0.553	2.580	3.733
Firm size	36,316	22.812	1.459	21.719	22.651	23.665
Leverage	36,316	47.005	19.755	32.285	47.022	61.229
Profitability (ROA)	36,316	3.091	6.312	1.314	3.437	5.978
Operating cash flow	36,316	4.253	5.966	0.727	4.096	7.608
Deal value (ln_deal2)	36,316	5.686	4.186	0.000	6.843	9.110

Note: This table reports descriptive statistics for the main variables used in the analysis. The full analytical sample contains 36,316 announced M&A deals. The number of observations varies slightly across variables because some information is unavailable for all deals. Continuous explanatory variables are winsorized at the 1st and 99th percentiles, while deal duration is reported in raw days.

The empirical strategy combines standard Cox proportional hazards models with a cause-specific competing-risks approach (Xia, 2011). The completion pathway is estimated using the following Cox proportional hazards model:

$$h_i^{comp}(t|X_i = h_0^{comp}(t)\exp\ (\beta_1 \ln\_NegPressure_i + \beta_2 Controls_i + \gamma_t + \delta_j) \quad (3)$$

The termination pathway is estimated using a cause-specific hazard model in which completed deals are treated as competing events:

$$h_i^{term}\ (t|Xi)\ = h_0^{term}(t)\exp\beta_1 \ln\_NegPressure_i + \beta_2 Controls_i + \gamma_t + \delta_j) \quad (4)$$

where $h_0^{comp}(t)$and $h_0^{term}(t)$are the baseline hazards for completion and termination, respectively, $Controls_i$ denotes the vector of firm- and deal-level controls, and γ_t and δ_j represent year and industry fixed effects. The completion model examines whether negative feedback accelerates successful resolution. The cause-specific termination model treats completion as a competing event and estimates whether negative feedback raises the hazard that an announced transaction fails before completion.

4. Results

The results suggest that completion and termination should not be treated as equivalent outcomes. In a parsimonious completion model that includes year and industry fixed effects, negative green innovation performance feedback is positively associated with the completion hazard (HR = 1.062, $p < 0.01$; not reported in Table 2 for brevity). However, this association disappears after adding the full set of firm- and deal-level controls (HR = 0.993; see **Table 2**). The completion-side result is therefore not robust and provides no strong evidence that green innovation underperformance is associated with faster deal completion.

Table 2. Main hazard results.

Variables	Completion hazard	Termination hazard
Negative green innovation feedback	0.993	1.098**
Firm size	0.789***	0.843***
Leverage	0.999	0.997
Profitability (ROA)	0.998	0.969***
Operating cash flow	1.018***	0.991
Firm age	0.919	1.115
Equity	1.141	3.476***
Mixed	1.079	7.216***
Other	1.193	3.383***
Deal value	1.053***	1.091***
Deal value missing indicator	0.938	3.660***
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	36,315	36,185

Note: Cash is the omitted baseline category for payment method. Column (1) presents the fully controlled Cox model for deal completion based on 36,315 observations. Column (2) presents the cause-specific Cox model for deal termination/withdrawal based on 36,185 observations. All models include year and industry fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The more stable finding emerges on the termination side. In the cause-specific competing-risks model, negative green innovation feedback is positively associated with a higher hazard of deal termination or withdrawal (HR = 1.098, $p < 0.05$). Substantively, this implies that firms lagging behind their industry peers in green innovation face a greater risk that announced acquisitions break down before completion. The evidence is consistent with the view that underperformance-induced urgency tends to amplify execution frictions rather than reduce them in the Chinese M&A context.

These findings should be interpreted within the scope of the research design. The study does not estimate whether firms with weak green innovation are more likely to initiate M&A in the first place. Instead, it shows that, once a deal has already been announced, negative green innovation feedback is associated primarily with a higher probability of failure during the resolution stage.

As an additional robustness check, we estimated a stratified Cox model for the completion pathway to address potential violations of the proportional hazards assumption. The coefficient on negative green innovation performance feedback remains insignificant (HR = 1.003; result not tabulated), suggesting that the completion-side null result is unlikely to be driven by non-proportional hazards. Taken together with the competing-risks estimates, the evidence continues to indicate that negative green innovation performance

feedback is more closely associated with termination risk than with faster completion.

5. Conclusion

This short paper examines how negative green innovation performance feedback relates to the resolution of announced M&A deals in China. The analysis shows that green innovation underperformance is not robustly associated with faster deal completion, but is positively associated with a higher hazard of termination or withdrawal. The main implication is that the pressure generated by green innovation shortfalls may encourage strategic action without necessarily improving execution quality.

The paper contributes to research on performance feedback and M&A by shifting attention from deal initiation to deal resolution. It also shows the value of distinguishing successful completion from failure when analyzing post-announcement outcomes. For firms seeking to close green capability gaps through acquisition, the results suggest that urgency should be matched with stronger target screening, valuation discipline, and regulatory preparation.

The analysis remains conditional on announced deals and relies on a citation-based proxy for green innovation underperformance. Even so, the evidence points to a clear conclusion: in the post-announcement stage of M&A, negative green innovation feedback is more closely linked to execution risk than to faster completion.

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