Original Research

Executives' Political Influence, Green M&A and Green Innovation: Evidence from China's Heavily Polluting Private Firms

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Abstract

Literature on green M&A (merger and acquisition) drivers is mainly from the perspective of conforming legitimacy, but studies based on a dual legitimacy perspective are still lacking. Our study introduces executives' political influence and investigates how it contributes to green M&A using the dual legitimacy theory. Using a dataset of 409 heavily polluting private firms between 2012 and 2020, we find the conformity and initiativeness of executives' political influence will drive heavily polluting firms to implement green M&A, proving its dual legitimacy. The above finding was tested under several robustness tests, such as Tobit regression and changing measurement methods, and the endogeneity test. Further, we find executives' political influence is more inclined to post-merger strategic green innovation with a low "green concentration", and this phenomenon has positive industry and spatial spillover effects, implying that it is mostly motivated by policy arbitrage rather than substantive upgrading. Finally, based on an external governance perspective, we find ESG rating and media supervision play a role in debiasing between executives' political influence and post-merger strategic green innovation. Our study contributes to the environmental governance function of executives' political influence, which gives significant theoretical significance and practical insights for the green transformation of heavily polluting private firms.

Keywords: Executives' political influence, Green M&A, Strategic green innovation, ESG rating, Media supervision

Introduction

China's economic development relies more on an extensive growth model that includes high energy consumption, emissions, and pollution, and this has resulted in a large amount of consumption and waste [1]. Resource and environmental issues are becoming the major bottlenecks restricting sustainable development, so promoting green transformation has become an inevitable choice to achieve high-quality economic development

[2,3]. In the practice of green innovation, compared with internal environmental protection investment with a long investment cycle and high uncertainty, green M&A has an obvious speed advantage and "eyeball effect" [4,5]. So it has become a crucial alternative for heavily polluting firms to alleviate increasingly serious environmental problems and achieve sustainable corporate development. The existing green M&A literature is mainly based on the classical theoretical logic of "environmental regulation-green M&A- green innovation performance," exploring

the driving effects of formal and informal environmental regulation, respectively. The research shows that formal environmental regulation compels heavily polluting firms to conduct green M&A, primarily by using the government's public authority to create a range of concrete, legally binding standards or rules [6]. Informal environmental regulation is a way for the public, media, and social groups to negotiate, expose, or boycott heavy polluters to implement terminal treatment, thereby increasing the likelihood of green M&A [7,8]. It is not difficult to find that most of the existing literature has examined green M&A drivers from a confirming legitimacy[1] perspective, which is essentially a reactive approach to green behavior consistent with institutional or social perceptions in order to cope with the pressure of environmental protection. Drawing from legitimacy theory [9], we argue that green M&A is driven by a dual legitimacy, namely confirming legitimacy and strategic legitimacy[2]. The latter highlights firms' initiative in practice, which is critical for them to actively exploit green markets and obtain the required resources. However, the importance of strategic legitimacy for driving green M&A remains surprisingly unexplored in the specific relevant studies on dual legitimacy.

To address this gap, we introduce executives' political influence, representing firms' political affiliation and social relationship quality [10], and investigate how it contributes to green M&A drawing from dual legitimacy theory. On the one hand, according to institutional theory, executives with greater political influence are often undoubtedly subject to stronger coercive isomorphic pressure than ordinary ones [11]. That is, it reflects conforming legitimacy, which emphasizes that external pressures and identity constraints compel firms to actively respond to government requirements, increasing the likelihood of green M&A. On the other hand, executives' political influence facilitates close social interaction between the firm and its stakeholders, enhancing environmental awareness [12]. This is strategic legitimacy, which means firms proactively gain legitimacy by signaling legitimacy to the outside world through green M&A. Accordingly, our main argument is that the conformity and initiative of executives' political influence will drive heavily polluting firms to implement green M&A in a Chinese context where ties and relationships are more important.

The phenomenon of executives with political influence in private firms is now widespread. And since the strategic decision of "vigorously promoting ecological civilization" was put forward, many excellent ones are already actively pursuing green M&A with fantastic outcomes. Therefore, we test our argument using a sample of 409 green M&A in heavily polluting private firms listed on A-shares Shenzhen and Shanghai from 2012 to 2020. In regression analyses utilizing these data,

executives' political influence does promote green M&A in terms of both conforming legitimacy and strategic legitimacy. More interestingly, this paper explores the true motivations of executives' political influence driving green M&A, using the "quality" and "quantity" of post-merger green innovation as an entry point. We find that heavily polluting private firms with executives' political influence still tend to be post-merger strategic innovation with a low "green concentration", and this phenomenon has positive industry and spatial spillover effects. Finally, we find ESG rating and media supervision play an important role in debiasing between executives' political influence and post-merger strategic green innovation.

The main contributions of this study are threefold. First, from the perspective of executives' political connections, this paper provides a new explanation for the driving mechanism of green M&A in heavily polluting private firms. Existing research on green M&A drivers is mainly from the perspective of conforming legitimacy, but studies based on dual legitimacy are still relatively lacking. Because strategic legitimacy is crucial for firms to actively exploit the green market and obtain the required resources, our study explores executives' political influence on green M&A from a dual legitimacy perspective, expanding the research related to green M&A drivers. Second, this paper provides empirical evidence for whether executives' political influence serves a sustainable role in environmental governance. Using the "quality" and "quantity" of post-merger green innovation as a starting point to examine the real motivations of firms with executives' political influence in implementing green M&A, our analysis reveals that it is only policy arbitrage rather than substantive upgrading. It provides additional empirical evidence for research on executive political connections' environmental governance. Third, this paper identifies important debiasing mechanisms for policy arbitrage in heavily polluting private firms' green innovation. The policy arbitrage of executives' political influence in environmental governance is debiased only when external governance is strengthened. This contributes to the environmental governance function of executives' political influence, which gives significant theoretical significance and practical insights for the green transformation of heavily polluting private firms.

The remainder of this paper is structured as follows: The next section provides an overview of the theoretical background and the formulation of our hypotheses. The third section offers a description of the sample and methodologies. The fourth section presents the empirical results. The fifth section provides additional analyses, followed by a discussion and conclusions in the final section.

Literature Review and Research Hypotheses

Literature Review

Compared with other forms of green management activities, green M&A has an obvious advantage in speed [4]. Through green M&A, heavily polluting firms can

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1 Confirming legitimacy means firms gaining legitimacy by actions that meet social expectations, emphasizing "conformity."

2 Strategic legitimacy means firms take the initiative to gain legitimacy by communicating legitimization signals to the outside world via incentive symbols, emphasizing "initiativeness."

quickly absorb advanced acquirers' green production equipment and technology, as well as realize greener production in a short time, improving their green innovation ability and green image [13] and guaranteeing the pursuit of economic benefits [14]. In recent years, more and more heavy polluters have achieved significant results in transforming their development through green M&A activities, and thus, green M&A has gradually become a hot topic in academic fields.

The existing literature on green M&A is mainly based on the classical theoretical logic of "environmental regulation-green M&A-green innovation performance." In general, environmental regulations can mainly be divided into two different types, namely formal regulations (Command-and-control regulations and market-based incentive regulations) and informal regulations [15]. Command-and-control regulation refers to a mandatory environmental policy that restricts pollution emissions at a specific time or in a specific area by managing production processes, material use, or other business activities [16]. It has a certain compulsory nature, which forces small energy- and emission-intensive firms to close down, suspend operations, merge with others, or shift to different production lines. At this time, in order to quickly meet stringent environmental standards, green M&A becomes one of the effective measures to reduce pollution and protect the environment. Market-based incentive regulation is a kind of government instrument that motivates firms to reduce pollution emissions through market signals [17]. More specifically, governments can create a market (emissions trading) or use existing markets (pollution emission fees and environmental taxes) to coordinate firms' environment-related behavior [18]. However, it is worth noting that firms often have to bear certain costs to transition to cleaner production. When firms consider it too costly to assume social responsibility for protecting the environment, implementing a green M&A strategy may not be conducive to their sustainable development after weighing the costs and benefits [19]. Therefore, the impact of formal environmental regulation on green M&A may show an inverted U-shaped relationship. For example, Qiu et al. [20] examine the heterogeneous effects of formal environmental regulations on firms' green M&A. The empirical evidence finds an inverted U-shaped relationship between market-based incentive regulations and green M&A, and an insignificant relationship between command-and-control regulations and green M&A.

Both the public's attention to environmental pollution and the public's transparency in environmental pollution disclosure have brought enormous pressure on the government and polluters, which has evolved into informal environmental regulation. From the existing research [7,21], informal environmental regulation depends on public environmental awareness, which increases the likelihood of green M&A mainly by catering to the public's interests. As a collection of stakeholders, if a firm does not meet the stakeholders' interest demands

in its operation, then the stakeholders will certainly not invest their held resources in it again. Therefore, green M&A becomes an effective means for heavy polluters to fulfill the public's desire for environmental protection, reduce the cost of public anger, and maintain corporate reputation. For example, Pan et al. [8] discover that the greater the media pressure, the more likely heavy polluters are to participate in green M&A.

In summary, existing literature has explored the mechanisms driving green M&A mainly from the perspective of conforming legitimacy and yielded productive research findings. However, contextual research based on a dual legitimacy approach still needs to be completed. According to the dual legitimacy theory, this paper argues that executives' political influence represents a firm's political affiliation and social relationship quality, and has dual legitimacy characteristics that may influence green M&A. Then, in a Chinese context where "ties" and "relationships" are more important, does executives' political influence encourage green M&A? If the probability of green M&A increases, does executives' political influence promote post-merger green innovation, and does it have industry and spatial spillover effects? Moreover, if executives' political influence promotes post-merger strategic green innovation, how can these trends be debiased? Our paper attempts to explore these questions.

Hypotheses

Executives' Political Influence and Green M&A

In contrast, without state ownership as a blood tie, listed, privately controlled firms have to address an unfavorable economic environment. A potential way out for executives at listed, privately controlled firms is to establish close relationships with politicians. Based on the dual legitimacy theory, this study suggests that the conformity and initiative of executives' political influence will drive heavily polluting firms to implement green M&A.

On the one hand, from the perspective of conforming legitimacy, green M&A by politically influential executives is a temporary choice to avoid various environmental regulations and strategic responses. Firstly, in terms of coercive isomorphic pressure, firms with greater executive political influence tend to face more pressure from media and public scrutiny. Institutional theory emphasizes that firms are embedded in a specific institutional environment and can only survive and thrive if they conform to that environment [22]. Especially in recent years, the country has paid much attention to environmental protection, so executives with great political influence will feel the government's intense green transformation push. Meanwhile, in terms of identity constraints, for individual executives, executives having political influence means that executives hold both economic and political identities [23]. This means the maintenance or enhancement of executives' political

influence is largely related to firms' performance and market image. As previously reviewed, green M&A is a specific act to quickly gain public recognition and maintain a good reputation. Therefore, in this context, under external coercive pressure and identity constraints, firms whose executives have political influence will adopt green M&A measures to reduce environmental violations and thus maintain a good market image.

On the other hand, from the perspective of strategic legitimacy, the contribution of executives' political influence to green M&A is mainly reflected in environmental awareness and resource collaboration. Social network theory suggests that individuals who are in the same network are more likely to form uniform values and behavioral norms [24]. The largest number of government officials are gathered in our political organs, and their outstanding commonality is that they have a strong sense of social responsibility and sustainable development. Then, when executives have political influence, it is to some extent an indication that their values and behavioral norms have passed the public test, as well as being equally committed to social responsibility and environmental responsibility [25]. With the improvement of environmental awareness, heavily polluting private firms with high political influence will take the initiative to seek green M&A, which helps enhance public satisfaction and investor confidence, so as to obtain legitimacy. Besides, executives' political influence can help companies bring in diverse information and a broader knowledge base. Specifically, executives' political influence can facilitate close social interactions with the outside world. This motivates firms to coordinate and integrate information and resources provided by various stakeholders, which in turn helps them to reconstruct their own knowledge systems, grasp market opportunities [12], and enhance the possibility of green M&A.

According to the above analysis, we propose the first hypothesis:

H1: Executives' political influence will drive heavily polluting firms to implement green M&A.

Executives' Political Influence and Quality of Post-Merger Green Innovation

Based on the transformation and upgrading theory, scholars have defined the connotation of green transformation as including not only whether there is a tendency to green M&A, but also if they engage in green technological innovation [26]. Green innovation is a concept that is internally driven and externally responsive, defined as the development of new products, processes, or technologies that protect the ecological environment through pollution control, waste recycling, energy conservation, and emission reduction [27]. According to the existing research, we classify green innovation into two types with distinguishable motivations, i.e., green substantive innovation and green strategic innovation [28].

Our study speculates that executives' political influence will only promote post-merger strategic green innovation. The specific reasons are as follows. First, under the green innovation-driven strategy, when executives have great political influence, they will feel the government's intense green innovation push [29]. As a result, firms are more likely to invest in strategic breakthroughs that yield immediate benefits in order to fulfill government innovation standards and avoid government penalties. Second, higher executives' political influence not only means that private firms will receive more scarce resources from the government, such as innovation subsidies and tax breaks, despite mediocre innovation results, but it may also lead these firms to persuade government officials in charge of reviewing green innovation projects to relax their assessment of the quality of their green innovation results. Finally, politically influential executives are more likely to fall into the "innovation race" tournament [30], failing to fully follow and implement the high-quality green innovation development strategy advocated by the central government. They tend to induce private firms to invest resources in non-innovative economic or strategic innovation activities that are less difficult to innovate and have quicker results.

According to the above analysis, we propose the second hypothesis:

H2: Executives' political influence will only promote post-merger strategic green innovation, not post-merger substantive strategic innovation.

Methodology

Data and Sample

We construct a dataset based on information collected from three sources. First, we obtain the green M&A events of A-share listed firms in Shenzhen and Shanghai from the M&A announcement, and the rest of the financial data is derived from the China Securities Market and Accounting Research (CSMAR) database. Second, a patent database comes from the Incopat patent database and the State Intellectual Property Office. We cross-checked this data with the later-released firms' annual patent applications database in the Chinese Research Data Services Platform (CNRDS). Third, all listed firms publicly disclosed information, including firm-relevant financial data, is derived from the CSMAR and Wind databases.

Heavily polluting firms are a primary source of environmental pollution in China and participate in implementing green mergers and acquisitions. In 2012, Shenzhen and Shanghai Stock Exchanges made it compulsory for listed firms to disclose information about institutional investors' site visits. Meanwhile, private firms have great potential for green transformation. Since China put forward the strategic decision of "vigorously promoting ecological civilization," many excellent ones are already actively pursuing green M&A with fantastic outcomes. Hence, we use the data of Chinese-listed

private firms in heavily polluting industries from 2012 to 2020 as our sample. Then, following the methodology of existing studies [8,31,32], we use six criteria for sample selection: (1) the main and target firms are both Chinese listed firms, excluding ST companies with poor operating conditions; (2) the types of M&A transactions are asset acquisition, merger by absorption, or tender offer; (3) the merger and acquisition transaction has been completed; (4) excluding M&A samples with total transactions less than 1 million yuan; (5) retaining the largest amount of transaction events for different targets in the same year; (6) excluding samples with missing critical data. After the above processing, our final sample consists of 409 green M&A observations. In order to eliminate the influence brought by extreme values, we have conducted winsorize processing on continuous variables at the 1% level.

Variables

Dependent Variables

Drawing lessons from previous research [8,31], this article uses content analysis to analyze M&A announcements of heavily polluting listed firms. According to the M&A background, purpose, and business scope, as well as the impact on acquirers through M&A announcements, matching 'Green Industry Guidance Catalogue (2019 Edition)' and 'Guidance Catalogue of The Key Products and Services of Strategic Emerging Industry,' we determine whether the M&A is 'green.' Thus, we use a binary green M&A variable, which we code as 1 if a firm has GMA behaviors, and 0 otherwise [33].

Green substantive innovation is high-quality green innovation behavior aimed at promoting the advancement of corporate green technology. Green strategic innovation ensures that firms meet social expectations by pursuing the "quantity" and "speed" of green innovation to seek other benefits. Therefore, based on the definition of China's patent law and existing research, we describe the two types of innovation behavior from the perspective of innovation effects [34]. That is, the natural logarithm of the green invention patent number plus one is used to measure a firm's substantive green innovation (Sub GI); the natural logarithm of the green utility patent number plus one is identified as strategic green innovation (Str GI).

Independent Variable

China is in a period of economic transformation where the government still controls key resources. In this case, many private executives actively participate in politics and compete for political posts, such as National People's Congress (NPC) deputies and Chinese People's Political Consultative Conference (CPPCC) members at all levels (national and regional). Varying NPC / CPPCC memberships have access to various levels of officials and resources (especially political resources), i.e., they

represent differences in political influence [35]. Therefore, consistent with prior studies, this paper characterizes Chinese private firm executives' political influence according to their political status hierarchy in the green M&A year [36]. The general manager and chairman have the authority to make key decisions in the firm's strategic planning and decision-making [37]. Moreover, they have much more rights to speak than other members of senior management, so our study defines executive political influence as the highest level of political affiliation between the general manager and chairman. Specifically, we construct a five-point scale based on the executives' political hierarchy to measure the strength of executives' political influence.

Control Variables

To examine the relationship between PC_level and GMA, we controlled for numerous variables that the literature has shown to impact the proposed relationship. First, larger and longer-established private firms are more likely to have politically influential executives [38]. Accordingly, we measured the size of the firm by taking the logarithm of its total assets. Regarding firm age, we control for this by calculating the time gap between the year of acquirers' establishment and the year when M&A occurred. Second, because firms differ in their financial leverage, financial performance, cash holding, and tangibility of assets, these financial endowments affect their green behavior [39]. To account for this, we control for prior differences among acquirers by debt, net profit, cash amount, and fixed assets by total assets, respectively [4,27]. Further, research has shown that corporate governance characteristics can also influence political behavior and environmental corporate social responsibility [40]. Therefore, we control for corporate governance characteristics, including the ratio of the largest shareholder, independent directors, female directors, and the duality of the general manager-chairman. The definitions of control variables and other variables can be seen in Table 1.

Model Design

Firstly, given that the dependent variable is binary, with or without green M&A, it is decided to evaluate the selected variables using a binary logistic model. The binary logistic model is thought to be the best suitable instrument because of its predictive power [41]. Further, binary logistic estimation does not assume covariances and equal variance multivariate normality of the test variables [42]. As a result, we specify the model in Equation:

$$GMA = \beta_0 + \beta_1 PC\_level + \beta_2 Controls + \Sigma Year + \Sigma Iudustry + \varepsilon \qquad (1)$$

Secondly, taking PC_level as the explanatory variable and Sub GI and Str GI as the explained variables, we

Table 1. Variable specifications.

Variable Types	Variable Names	Variable Abbreviations	Variable Specifications
Dependent variables	Green Merger and Acquisition	GMA	If a heavily polluting enterprise has a green M&A, take 1; otherwise, take 0.
	Substantive Green Innovation	Sub GI	The natural logarithm of the green invention patent number plus one.
	Strategic Green Innovation	Str GI	The natural logarithm of the green utility patent number plus one.
	Strategic green innovation's peer firms spillover effects	Str GISE_ind	In the same industry the average Str GI of other firms excluding the focal firm
	Strategic green innovation's spatial spillover effects	Str GISE_pro	In the same province the average Str GI of other firms excluding the focal firm
Independent variable	Executives' Political Influence	PC_level	NPC deputies (CPPCC members) are assigned a value of 5. Similarly, the provincial level is 4, the municipal level is 3, the county level is 2, and the others are 1.
Moderator variables	ESG Rating	ESG	The ESG rating published by HUAZHENG.
	Media Supervision	Media	The natural logarithm of the negative media coverage plus one.
Control variables	Firm Size	Size	The natural logarithm of the total asset.
	Firm Age	Age	The number of years since the firm was established.
	Financial Leverage	Lev	The debt divided by the total assets.
	Financial Performance	Roa	The net profit divided by the total assets.
	Cash Holding	Cash	The cash amount divided by the total assets.
	Tangibility of Assets	PPE	The fixed assets divided by the total assets.
	Research and Development Level	RD	The natural logarithm of the R&D expenditure.
	Ownership Concentration	Top1	The shareholding ratio of the largest shareholder.
	Duality Of General Manager-Chairman	Dual	If the manager is also the board chair, take 1; otherwise, take 0.
	Independent Directors Ratio	Indep	The ratio of independent directors relative to all board members.
	Female Directors Ratio	Female	The ratio of the number of female directors to all board members.
Fixed Effects	Yearly Fixed Effects	Year	A series of dummy variables of different years.
	Industrial Fixed Effects	Industry	A series of dummy variables of different industries.

Note: All continuous variables are winsorised at bottom 1% and top 99% levels.

estimate the effect caused by PC_level on post-merger green innovation through the OLS estimation. As a result, we specify the following model in Equation:

$$Sub\ GI = \beta_0 + \beta_1 PC\_level + \beta_2 Controls + \Sigma Year + \Sigma Iudustry + \varepsilon \qquad (2)$$

$$Str\ GI = \beta_0 + \beta_1 PC\_level + \beta_2 Controls + \Sigma Year + \Sigma Iudustry + \varepsilon \qquad (3)$$

Where GMA stands for green M&A, Sub GI stands for substantive green innovation, Str GI stands for strategic green innovation, PC_level stands for the level of private firm executives' political influence, and Controls denote various control variables. $\Sigma Year$ and $\Sigma Iudustry$ represent year and Iudustry fixed effect respectively, and ε denotes the random disturbance term. This paper

controls the industry and the year - the fixed effects - in the model. We include a year-fixed effect, to remove time-invariant unobserved heterogeneity from the error term. We additionally account for an acquirer's industry fixed effects to eliminate other invariant unobserved heterogeneity across industries.

Results and Discussion

Descriptive Statistics and Correlation Analysis

Panel A in Table 2 presents the descriptive statistics for the main variables. Among the 409 firm-year observations from 2012 to 2020, the mean value of GMA is 0.445 and the standard deviation is 0.498, showing a small number of heavily polluting enterprises undergoing green transformation. On average, the sample firms had

Table 2. Summary Statistics and Correlation Analysis

Panel A: Descriptive statistics for all variables.

Variables	Full Sample (N=409)				
	Mean	SD	Min	Median	Max
GMA	0.445	0.498	0.000	0.000	1.000
Sub GI	0.448	0.731	0.000	0.000	3.611
Str GI	0.565	0.766	0.000	0.000	3.367
PC_level	2.142	1.573	1.000	1.000	5.000
Size	21.906	1.014	19.524	21.781	25.341
Age	15.687	5.329	3.000	15.000	39.000
Lev	0.380	0.168	0.026	0.372	0.933
Roa	0.031	0.033	-0.074	0.024	0.200
Cash	0.150	0.095	0.008	0.125	0.629
PPE	0.238	0.118	0.025	0.223	0.602
RD	17.457	1.212	9.903	17.467	20.737
Top1	0.309	0.136	0.064	0.292	0.773
Dual	0.384	0.487	0.000	0.000	1.000
Indep	0.375	0.057	0.250	0.333	0.600
Female	0.164	0.129	0.000	0.143	0.714

Panel B: Mean difference among subgroups.

Variables	With or without GMA			With GMA		
	GMA=0 (227)	GMA=1 (182)	Mean Difference	PC_level=1 (105)	PC_level=5 (31)	Mean Difference
Sub GI	/	/	/	0.419	0.525	-0.106
Str GI	/	/	/	0.615	0.928	-0.312*
PC_level	1.978	2.346	-0.368**	1.000	5.000	-4.000
Size	21.986	21.806	0.18*	21.869	21.479	0.390**
Age	15.974	15.33	0.644	15.838	14.71	1.128
Lev	0.391	0.366	0.025	0.37	0.356	0.014
Roa	0.031	0.031	0.000	0.03	0.025	0.005
Cash	0.153	0.146	0.007	0.143	0.152	-0.009
PPE	0.247	0.228	0.018	0.226	0.235	-0.009
RD	17.439	17.478	-0.039	17.424	17.736	-0.312
Top1	0.303	0.315	-0.012	0.308	0.352	-0.044
Dual	0.374	0.396	-0.021	0.438	0.387	0.051
Indep	0.377	0.373	0.003	0.375	0.369	0.006
Female	0.160	0.168	-0.008	0.171	0.188	-0.017

Panel C: Pairwise correlations between independent variables

	GMA	PC_level	Size	Age	Lev	Roa	Cash	PPE	Top1	Dual	Indep	Female	VIF
GMA	1.000												
PC_level	0.116**	1.000											1.32
Size	-0.088*	-0.096*	1.000										3.26
Age	-0.060	-0.096*	0.273***	1.000									2.24
Lev	-0.074	-0.023	0.519***	0.183***	1.000								2.16
Roa	-0.006	-0.031	-0.041	-0.005	-0.288***	1.000							1.66
Cash	-0.036	-0.009	-0.170***	-0.188***	-0.220***	-0.027	1.000						1.71
PPE	-0.077	0.018	0.171***	0.169***	0.150***	0.049	-0.278***	1.000					2.06
Top1	0.043	0.091*	0.086*	0.042	-0.015	0.174***	0.040	0.122**	1.000				1.62
Dual	0.022	-0.065	-0.155***	-0.002	-0.060	-0.043	0.034	-0.027	0.155***	1.000			1.53
Indep	-0.027	-0.042	-0.156***	0.035	-0.050	-0.052	0.047	-0.037	0.002	0.095*	1.000		1.47
Female	0.030	-0.077	0.036	0.072	0.043	0.051	-0.094*	0.114**	0.051	-0.018	-0.052	1.000	1.57

Note: This table shows mean, standard deviation (SD), minimum (Min), median, and maximum (Max) (Panel A), differences in means of these variables between with or without GMA, and between PC_level=1 and PC_level=5 (Panel B), and Pearson correlation coefficients between these variables (Panel C). The variables are defined in Table 1. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

more strategic green innovation (0.565) than substantive green innovation (0.448). The average Size, Age, Lev, Roa, Cash, PPE, RD, Top1, Dual, Indep, and Female are 21.906, 15.687, 0.380, 0.031, 0.150, 0.238, 17.457, 0.309, 0.384, 0.375, and 0.164, respectively. These statistics are consistent with the existing literature and are within a reasonable range.

Panel B conducts a comparative analysis of the mean differences between firms with and without GMA. The results show that private firms with green M&A have significantly greater executive political influence than those that do not. In addition, among the sample that undertook green M&A, green innovation performance varied considerably across political influence. It

provides a solid foundation for further research, and we discuss the formal cause-and-effect relationships using the estimated regression analysis equations in the next section.

Panel C reports the descriptive statistics and correlations for each variable in this study. The correlation coefficient between the independent variable (PC_level) and the dependent variable (GMA) is 0.116 at 5% level, which, in preliminay instances, verifies the baseline hypothesis of this article. Moreover, we also calculate the variance inflation factor (VIF) of the variables, and the VIF of all the variables was less than 4. The above results indicate that there is no serious multicollinearity problem among the variables.

Table 3. The impact of executives' political influence on green M&A, and post-merger green innovation.

Variables	Logistic regression		OLS regression	
	GMA		Sub GI	Str GI
	(1)	(2)	(3)	(4)
PC_level		0.164**	0.054	0.129***
		(2.41)	(1.51)	(3.13)
Size	-0.173	-0.146	0.374***	0.349***
	(-1.37)	(-1.13)	(3.86)	(3.12)
Age	-0.030	-0.030	-0.019	-0.030*
	(-1.30)	(-1.27)	(-1.33)	(-1.83)
Lev	-0.775	-0.819	0.087	0.369
	(-1.01)	(-1.04)	(0.18)	(0.67)
Roa	-3.910	-3.540	0.765	-4.072*
	(-1.13)	(-1.01)	(0.37)	(-1.70)
Cash	-2.161*	-2.014*	0.541	2.038**
	(-1.80)	(-1.65)	(0.68)	(2.23)
PPE	-1.158	-1.132	-0.021	0.408
	(-1.23)	(-1.19)	(-0.03)	(0.54)
RD	/	/	-0.151**	-0.082
	/	/	(-1.99)	(-0.94)
Top1	1.223*	0.955*	0.189	-0.019
	(1.72)	(1.80)	(0.41)	(-0.04)
Dual	-0.038	0.018	-0.157	0.003
	(-0.17)	(0.08)	(-1.20)	(0.02)
Indep	-1.083	-0.852	1.412	1.264
	(-0.57)	(-0.45)	(1.21)	(0.94)
Female	0.533	0.686	-0.135	-0.499
	(0.64)	(0.80)	(-0.28)	(-0.89)
Constant	5.598**	4.500	-7.174***	-8.205***
	(1.99)	(1.56)	(-3.25)	(-3.23)
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
N	409	409	182	182
Pseudo R^2 or R^2	0.0447	0.0549	0.0670	0.1571

Note: Robust t statistics are presented in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Regression Results

Executives' Political Influence and Green M&A

Table 3 shows the results of the regression. Model (1) only includes control variables. Cash negatively influences GMA (β=-2.161, $p<0.1$); thus, high cash ratios may mean that firms borrow less or undertake other financing activities, which may limit their ability to undertake larger green M&A deals. Moreover, as expected, Top1 has a positive and significant effect on GMA (β=1.223 $p<0.1$). The more concentrated the controlling rights of the firms, the more conducive to the centralized use of resources [43], increasing the likelihood of green M&A. Model (2) reveals that the addition of PC_level improved the explanatory effectiveness of the model, and the main effect of PC_level on GMA is strongly positive and significant (β=0.164, $p<0.05$), so H1 is verified.

Our empirical result confirms that the conformity and initiative of executives' political influence will drive heavily polluting firms to implement green M&A, proving its dual legitimacy. Specifically, executive political influence has a positive effect on corporate green M&A through coercive assimilation pressure, identity constraints, and environmental awareness. In conclusion, our findings enrich the scope of green M&A theory research and offer a new viewpoint on how green M&A might be integrated with dual legitimacy theory.

Executives' Political Influence and Quality of Post-Merger Green Innovation

In Models (3) and (4), the direct effects of PC_level on Sub GI and PC_level on Str GI (H2) are tested. H2 can be confirmed from the negative and significant relationships returned for PC_level on Str GI (β=0.129, $p<0.01$). Accordingly, our study confirms that PC_level will only lead to low-tech green innovation, that is, strategic innovation. Consistent with existing research, executives with political influence are more likely to fall into the "innovation race" tournament [28]. With the low success rate of green innovation, green innovation by heavily

polluting private firms is likely to be a "greenwashing" behavior to create a green image, which is not conducive to substantive green innovation.

Robustness Tests

Despite the many control variables included in the multivariate tests, our findings could just be capturing some random correlations rather than a causal association between PC_level and GMA. To assess the robustness of our findings, we carried out several robustness checks. Firstly, since GMA is a restricted discrete variable greater than zero, we draw on Greene [44] and again use a fixed effects panel Tobit model for robustness testing. The test results are presented in model (2) of Table 4. Crucially, there is no significant change in parameter estimation, or significance. Secondly, we employed a different measurement for dependent variables, that is, green innovation is measured by average patents for current and subsequent years. On this basis, we replicate our analysis and find that PC_level is significantly and positively related to Str GI at a 5% confidence level (see Model (4) in Table 4), while it is not related to Sub GI. In line with our earlier results, we confirm that executives' political influence can improve strategic green innovation.

Endogeneity Tests

Endogeneity can occur for a number of reasons. One of the most commonly discussed forms of this strategy is self-selection bias. We make use of the propensity score matching approach (PSM) to address the potential issue of self-selection [45]. Based on the median PC_level, all samples were divided into treatment and control groups. PC_level is taken as 1 when it is greater than the median of its corresponding index; otherwise, it is 0. Then we utilize Size, Age, Lev, Roa, Cash, PPE, Top1, Dual, Indep, and Female as matching variables and screens paired samples using 1:4 neighbor matching. As shown in Model (1) and (2) of Table 5, the matching regression findings are still consistent with the prior study, confirming the research premise once more. Meanwhile, considering the results

Table 4. Robustness tests: Tobit regression and Changing measurement methods.

Variables	Tobit regression		Changing measurement methods	
	GMA		Sub GI	Str GI
	(1)	(2)	(3)	(4)
PC_level		0.080**	0.022	0.098***
		(2.31)	(0.68)	(2.63)
Controls	Yes	Yes	Yes	Yes
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
N	409	409	182	182
Pseudo R^2 or R^2	0.0307	0.0371	0.1960	0.2472

Note: Robust t statistics are presented in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 5. Endogeneity tests: Propensity score matching and Instrumental variables method.

Variables	PSM		IV-Tobit		2SLS	
	GMA	Str GI	GMA	GMA	Str GI	Str GI
	(1)	(2)	(3)	(4)	(5)	(6)
PC_Mean			1.144***		1.004***	
			(10.37)		(8.79)	
PC_level	0.162**	0.113***		0.128*		0.216***
	(2.34)	(2.64)		(1.77)		(3.45)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control
N	375	162	409	409	182	182
Pseudo R^2 or R^2	0.0505	0.2059	0.2731	0.3113	0.2596	0.3368

Note: Robust t statistics are presented in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

of this paper may have endogeneity caused by twoway causality, we select instrumental variable (IV) for robust estimation. Following the previous literature [46], we use the mean executive political influence (PC_Mean) of all firms in the same year and region as an instrumental variable. First, since GMA is a binary variable, we test it using the IV-Tobit model. As shown in Model (4) of Table 5, PC_level is significantly and positively related to GMA at a 10% confidence level, which indicates that the benchmark results are robust. Second, for green innovation performance, it was estimated by a two-stage least square method. In the first stage, the regression coefficient of the instrumental variable (PC_Mean) is 1.004, and the Cragg-Donald Wald F statistic is 78.4829. The result indicates that endogenous variables and the instrumental variable are highly correlated, and there is no weak instrumental variable. In the second stage, the estimation coefficient of PC_level is still significantly positive at a 1% level (see Model (6) in Table 5), suggesting that our findings are robust to endogeneity correction.

Additional Analysis

The Strategic Green Innovation Spillover Effect of Executives' Political Influence

From the above analysis, it is clear that executives' political influence will drive heavily polluting firms to implement green M&A in terms of both adaptive legitimacy and strategic legitimacy. It also increases post-merger strategic green innovation without substantive green innovation, which essentially reflects policy arbitrage for heavily polluting private firms' green innovation. Importantly, this behavior of executives' political influence may also have spillover effects among peer firms and geographically proximate firms, triggering pan-greening and drift-greening green M&A within the same industry and the same province. The reason is that firms in the same industry face similar market environments and development prospects, and there are extensive social interactions, including competition, imitation, learning, and normative pressure

Table 6. The strategic green innovation spillover effect of executives' political influence.

Variables	Str GISE_ind	Str GISE_pro
	(1)	(2)
PC_level	0.144*	0.205***
	(1.72)	(2.83)
Controls	Yes	Yes
Year	Control	Control
Industry	Control	Control
N	182	182
Pseudo R^2 or R^2	0.2923	0.3735

Note: Robust t statistics are presented in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 7. The role of ESG rating and media supervision in debiasing between executives' political influence and post-merger strategic green innovation.

Variables	Str GI (1)	Str GI (2)
PC_level	0.123***	0.397**
	(2.93)	(2.47)
ESG	0.089	
	(1.31)	
PC_level×ESG	-0.076*	
	(-1.79)	
Media		0.253*
		(1.85)
PC_level×Media		-0.071*
		(-1.74)
Controls	Yes	Yes
Year	Control	Control
Industry	Control	Control
N	182	182
Pseudo R^2 or R^2	0.1804	0.1678

Note: Robust t statistics are presented in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

between peer firms and focal firms. Such frequent and strong interactions have stimulating and radiating effects on green strategic decisions among firms, triggering the homogeneity of green behaviors between focal firms and peer firms [47]. In addition, due to the "near neighbor is better than distant relative" effect, firms in the same province can have more timely insights and greater understanding the quality of post-merger green innovation, and are thus more likely to imitate policy arbitrage for focal firms' green innovation [48].

Therefore, it is necessary to further investigate whether executives' political influence's green innovation spillover effect in the same industry as well as in the same province. As shown in Model (1)- (2)from Table 6, PC_level is positively associated with Str GISE_ind (β=0.144, p<0.1) and Str GISE_pro (β=0.205, p<0.01), respectively. That is, executives' political influence has significant industry and spatial spillover effects on post-merger strategic green innovation, which is more evidence that it is mostly motivated by policy arbitrage rather than substantive upgrading.

How to Debiase Policy Arbitrage for Heavily Polluting Private Firms' Green Innovation?

Executives' political influence is a valuable resource that can make it easier for heavily polluting private firms to obtain debt financing and enjoy benefits such as lower tax rates, especially in developing countries where marketization is low and government regulation is more

severe. Combined with the findings of this paper, green M&A behavior driven by executives' political influence may be a strategic policy arbitrage to obtain government subsidies and tax benefits rather than a substantive transformation and upgrading of China's heavily polluting private firms. The main reason for this phenomenon is that external governance mechanisms are inadequate. Politically influential executives are more likely to fall into the "innovation race" tournament, and are unable to better leverage its strategic legitimacy. Therefore, as long as external governance is strengthened, policy arbitrage for green innovation will be debiased.

Based on an external governance perspective, this paper selects ESG rating and media supervision as proxy variables to explore their role in debiasing between executives' political influence and post-merger strategic green innovation. Specifically, ESG rating is a comprehensive evaluation of a firm's environmental, social, and corporate governance dimensions, and an important indicator of its sustainability [49]. The attention it brings enables investors and others to monitor firms from the outside, promotes the increase of environmental awareness among politically influential executives, and contributes to a simultaneous increase in the quality and quantity of green innovation. In addition, media supervision refers to the exposing of firms' environmental initiatives and environmental information by the media, including newspapers, magazines, radio, TV, internet forums, and other communication vehicles. It exposes firms to the public eye and places a strong legitimacy pressure and environmental burden on them [50]. To resolve the public opinion crisis and satisfy external stakeholders' environmental demands, politically influential executives will focus on improving their environmental behavior by promoting substantive green innovation through green M&A. On this basis, we will discuss below whether ESG rating and media supervision can debiase the role of executives' political influence on strategic green innovation.

The ESG rating index of HUAZHENG is C-AAA, with nine grades, assigned from 1 to 9. This study calculates the average of ESG ratings of each firm for four quarters each year, taking this as the comprehensive ESG rating of the firm for the corresponding year [51]. Meanwhile, drawing on Zhang et al. [52], we use the CNRDS listed firms' financial news database to count the number of negative news reports. To avoid order-of-magnitude interference, the natural logarithm of negative media reports plus one is identified as media supervision. As shown in Model(1)-(2) from Table 7, the interaction term between PC_level and ESG (*b=-0.076, p<0.1*), between PC_level and Media (*b=-0.071, p<0.1*) are negatively associated with Str GI. Therefore, ESG rating and media supervision can debiase policy arbitrage for green innovation and maximize substantive green transformation and upgrading, which provides a reference on how heavily polluting private firms can better leverage the strategic legitimacy of executives' political influence in sustainable development.

Conclusions

Conclusion

Green M&A is increasingly favored by heavily polluting firms and has become an essential choice for corporate green investment. Most of the existing literature has examined green M&A drivers from a confirming legitimacy perspective, which is essentially a reactive approach to green behavior consistent with institutional or social perceptions in order to cope with the pressure of environmental protection. However, it is worth noting that the importance of strategic legitimacy for driving green M&A remains surprisingly unexplored in the specific relevant studies on dual legitimacy. Executives' political influence, as a unique and scarce strategic asset, will drive heavy polluters to implement green M&A in terms of conformity and initiative. Thus, we use a sample of heavily polluting private firms from 2012 to 2020 to explore the relationship between executives' political influence and green M&A. The conclusions are as follows: First, as hypothesized, executives' political influence will drive heavily polluting firms to implement green M&A. The above finding was tested under several robustness tests, such as the Tobit regression and changing measurement methods, and the endogeneity test. Second, after implementing green M&A, firms with greater executives' political influence have significantly higher strategic green innovation. Third, executives' political influence has a spillover effect on post-merger strategic green innovation, specifically in the form of positive spillover effects on strategic green innovation for firms in the same industry and province. Finally, ESG rating and media supervision play a role in debiasing the effect of executives' political influence on strategic green innovation.

Theoretical Implications

This study makes several contributions to the literature. Firstly, from the perspective of executives' political influence, this study expands previous research on green M&A drivers. Existing studies have mainly used institutional theory and stakeholder theory to identify the role of government [6,20], media [8], and stakeholders [53] in driving green M&A. These studies implicitly assume that green M&A depends on firms' "conformity" in the face of external pressures, ignoring the fact that firms use their own "initiative" to actively pursue green routes. Our study provides an important addition to the existing literature by introducing executives' political influence from a novel perspective that integrates the theories of conforming and strategic legitimacy (dual legitimacy perspective). From the perspective of confirming legitimacy, politically influential executives make green M&A to maintain behavioral consistency with social regulations, and are able to mitigate socio-environmental institutional pressures and win stakeholder acceptance through the 'institutional logics' [11]. From

the perspective of strategic legitimacy, heavily polluting private firms with high political influence will take the initiative to assume environmental social responsibility, coordinate and integrate resources to shape a good corporate image through the 'effective logic' [25], and actively implement green M&A. Thus, it can be seen that dual legitimacy provides a more comprehensive explanation of the drivers of green M&A. This study deepens and enriches the relevant research findings of green M&A, which give significant theoretical significance and practical insights for the green growth of heavily polluting private firms.

Additionally, we extend the research related to the executive political connections' environmental governance function. Previous studies on the role of executive political connections in environmental governance have mostly focused on whether executive political networks [54] and political connections [55] directly promote corporate environmental investment or environmental disclosure levels. Nonetheless, there is little research on how executives' political influence affects post-merger green innovation. Drawing on Tong et al. [56], we categorize green innovation into two types with distinguishable motivations, namely, green substantive innovation and green strategic innovation, in contrast to previous studies that have concentrated more on the extent or content of green innovation. Using two different types of green innovation, we empirically find that executives' political influence is only policy arbitrage rather than substantive upgrading, which is often not sustainable.

Thirdly, from an external governance perspective, we introduce ESG rating [51] and media supervision [50], to clarify the debiasing mechanisms between executives' political influence and strategic innovation. Specifically, it is similar to the view of previous study [57], which argued that ESG rating events have contributed to promoting executives' awareness of the importance of green behavior for the long-term development of the firm and society more broadly. Meanwhile, the media can not only provide effective monitoring for firms' green innovation behaviors, but also help firms establish a good green image and meet the requirements of external environmental legitimacy. Therefore, this paper expands the boundaries of the application of external governance theory and paves the way for future research to examine how to debias the greenwash behavior of executives' political influence.

Practical Implications

The following policy implications are suggested for how to encourage heavily polluting private firms to engage in green M&A and improve post-merger green innovation. First, heavily polluting private firms should reasonably use the initiative of executives' political influence to promote green development. Executives' political influence can have a positive "resource effect" on corporate green M&A and post-merger strategic green innovation through coercive isomorphic pressure,

identity constraints, and environmental awareness. For firms, despite strategic green innovation that can undoubtedly promote their participation in environmental governance and social responsibility, they should be more committed to substantive green innovation to truly realize stakeholder value and take responsibility for promoting high-quality economic development. That is, in the era of "dual carbon," politically influential executives should be more motivated to establish a sense of environmental responsibility and lead their firms to build sustainable green competitive advantages.

Secondly, ESG rating agencies and the media need to be guided and encouraged to continuously increase their supervision of heavily polluting private firms and exercise their environmental governance function. ESG rating and media supervision, as the mainstream external supervision force nowadays, have exposing and deterring effects on corporate green innovation policy arbitrage, but they also present characteristics such as excessive hot pursuit and short-term nature. This paper finds that the stronger the ESG rating agencies and media supervision, the greater the informal environmental legitimacy pressure on firms with executives' political influence and the more inclined firms are to undertake substantive green innovation. Therefore, ESG rating agencies and the media need to carry out external supervision with the concepts of objectivity, independence, and continuous depth to truly become a tool to expose corporate policy arbitrage.

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Conflict of Interest

All the authors declare having no conflict of interest.

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