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How do Green Acquirers Select Targets? Value of Green Innovation in Takeovers

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A burgeoning literature on green mergers and acquisitions (M&As) is based on the assumption that acquirers are polluting firms and buy targets with green resources to gain sustainable development, ignoring the fact that acquirers can also have green resources. This study explores how green acquirers select their targets and realize benefits in the international takeover market. Drawing upon the resource-based view and information asymmetry perspective, we argue that green acquirers have a competitive advantage and prefer targets with lower firm-level (publicly listed target) and industry-level (targets from the related industry) information asymmetries in order to better estimate the target's value and avoid the risk of overpayment. Findings from 7788 M&As announced between 2005 and 2021 support our argument, showing that green acquirers buy targets with lower information asymmetries and earn higher returns. We also find that board characteristics and takeover experience are boundary conditions affecting the target selections of green acquirers. Our study contributes to green M&As and information economics by emphasizing the interplay of green innovation and lower information asymmetries in target selection and value creation.

Introduction

Green mergers and acquisitions (M&As) have emerged to improve the environmental sustainability of acquiring firms (Hu, Fang and Wu, 2023; Lu, Li and Wang, 2023; Yang and Chi, 2023; Zhao and Jia, 2022). Scholars emphasize 'green innovation' to elaborate on the benefits that polluted acquirers achieve after buying green targets. For instance, Lu, Li and Wang (2023) argue that polluting firms can move towards green transformation by acquiring environmentally sustainable firms. In short, existing studies are based on the fundamental assumption that targets have green resources before the deal, whilst acquirers do not. This line of argumentation is fretful, as the target–acquirer heterogeneity assumption considers acquirers with low green innovation and ignores acquirers with high green innovation. Thus, the question of how green innovation affects target selection remains unresolved. Accordingly, we examine how much acquirers' green innovation matters in the target selection. Specifically, we explore whether acquirers with green innovation – green acquirers – have specific target selections related to lower firm-level and industry-level information asymmetries, as both asymmetries have value implications.

The industrial revolution helped to improve economic growth, but at the cost of momentous environmental hazards (Carrión-Flores and Innes, 2010; Li *et al.*, 2024; Liao and Liu, 2021), and thus the efficient utilization of resources to protect the environment has become a global issue (Adomako *et al.*, 2023; Wang *et al.*, 2021). Consolidating the idea of green innovation into economic evolution enhances a firm's environmental sustainability and creates growth opportunities (Li *et al.*, 2019). In contrast to traditional innovation, green innovation involves producing goods that require less energy and fewer raw materials (Dangelico and Pujari, 2010), thereby reducing environmental pollution (Dangelico, 2016), and recycling production waste (Dangelico, Pujari and Pontrandolfo, 2017). Two forms of green innovation, green product and process innovation, enable focal firms to build a green brand image and differentiate their products from those of competitors (Sueyoshi and Wang, 2014). Therefore, we examine the role of green innovation (both green product and green process) in the M&A context for two purposes. First, we can easily segregate the associated value of green innovation from that of other innovations that are not purely sustainable. Second, we can determine whether green acquirers succeed or fail, as the 2018 Deloitte report shows that up to

a quarter of all M&A deals usually struggle to achieve or exceed the expected outcomes.[1]

We draw on green M&A (Hu, Fang and Wu, 2023; Li *et al.*, 2020; Lu, Li and Wang, 2023) and information economics (Cheng, Li and Tong, 2016; Cuypers, Cuypers and Martin, 2017) literature to address the following three research questions. (1) How do the green acquirers select target firms? (2) Do board characteristics and takeover experience affect the association between green acquirer and target selection? (3) Do the target selections of green acquirers generate takeover value? We argue that green acquirers have a competitive advantage due to green resources and are more likely to acquire publicly listed targets from related industries where information asymmetries are lower. This is so because publicly listed firms are more transparent and follow disclosure requirements (Moussa, Kotb and Helfaya, 2022; Rodrigues and Stegemoller, 2007), while it is hard to collect information about private targets (Ragozzino and Reuer, 2007). Also, an acquirer can better collect the target's information from a related industry (Perafan-Pena, Gill-De-Albornoz and Giner, 2022) because of information sharing within the industry through industry association conferences, networking events and CEO-level meetings (Raman, Shivakumar and Tamayo, 2013). However, one may argue that if the target is a publicly listed firm and is from a related industry, acquirers may not have an advantage over one another regarding available information. We propose that mere public information availability is insufficient to select the right target. In relation to a better target selection, an acquirer's competitive position emerging from green innovation determines how publicly available information is used to bargain on better terms. Furthermore, being competitive, green acquirers may not face intense competition among potential acquirers and they can attract targets to disclose accurate information.

Using an international sample of 7788 M&As from 2005 to 2021, we find that green acquirers (proxied by either product or process innovation) buy publicly listed targets from related industries. Board characteristics (i.e. board networks, board independence and gender diversity) and takeover experience are the boundary conditions under which green acquirers positively affect such takeover decisions. These board characteristics (i.e. board networks) increase access to accurate information (Omer, Shelley and Tice, 2014) and provide a better monitoring environment through independent and gender-diverse boards (Biswas, 2021; García-Sánchez *et al.*, 2019; Srinidhi *et al.*, 2020) to better estimate target value. Also, prior takeover experience helps acquirers enhance their capabilities in target selection (Renneboog and Vansteenkiste, 2019), and green acquirers with takeover experience are likely to select targets for which they can access more accurate information. We also find that green acquirers' preferences for specific targets generate higher acquirer returns after the acquisitions. Further, results show that green acquirers pay fair premiums and complete deals faster than non-green acquirers. Our results hold after addressing endogeneity-related issues and running a battery of robustness tests.

We make significant contributions to research on M&As. First, this study contributes to the target selection (Capron and Shen, 2007; Kaul and Wu, 2016; Yu, Umashankar and Rao, 2016) and green M&A (Gomes and Marsat, 2018; Lu, Li and Wang, 2023; Salvi, Petruzzella and Giakoumelou, 2018; Yang and Chi, 2023) literature by enhancing the understanding that acquirers are not always polluting firms and that green acquirers have certain takeover choices that create value. Carefully controlling for firm, deal, and country characteristics, we show how green acquirers buy targets in the takeovers. Although the availability of green resources provides a competitive advantage to firms, these resources should be used carefully to sustain competitiveness. Furthermore, contrary to most existing M&A studies that show negative returns to acquiring firm shareholders (Boone and Mulherin, 2008; Calcagno and Falconieri, 2014; Danbolt, Siganos and Vagenas-Nanos, 2015), we explicitly show that positive returns are generated if the acquiring firm has green innovation at place.

Second, we contribute to the information economics literature (Balakrishna and, Koza, 1993; Dow, Cuypers and Ertug, 2016) by highlighting the green acquirers' strategic behaviour in the takeover process. Our results align with the theoretical underpinnings of the information asymmetry perspective and suggest that green acquirers seek reduced uncertainty and transparency in target firms. The risk mitigation strategy ensures that the opaque or unforeseen liabilities of the targets do not compromise the acquirer's green innovation. Information asymmetries help how M&A deals are structured (Capron and Shen, 2007; Cuypers, Cuypers and Martin, 2017) and hinder the potential of takeover gains (Lewis and Bozos, 2019; Reddy and Fabin, 2020). We show that information factors are essential in takeovers, but firms should have a competitive advantage for their proper implication.

Third, our work adds to studies on board characteristics (Swaminathan, Murshed and Hulland, 2008; Teece, Pisano and Shuen, 1997; Yu, Umashankar and Rao, 2016) and prior takeover experience (Chao, 2018; Laamanen and Keil, 2008) by documenting that green acquirers can obtain better information about the target firm if their board members are connected to the

[1]https://www2.deloitte.com/content/dam/Deloitte/us/Documents/mergers-acqisitions/us-mergers-acquisitions-2018-trends-report.pdf

target firm, have independent and gender-diverse boards, and have experience of takeovers. In alignment with several studies (Ellis *et al.*, 2017; Wang and Xie, 2009), our findings underscore the role of good governance and takeover experience in improving information quality during the takeover process. Overall, we highlight board characteristics and takeover experience as the boundary conditions that intensify the association between green acquirers and target selections.

Literature review and hypotheses development

Target selection and green M&As

The key motives behind target selection include resource acquisition and deployment (Kaul and Wu, 2016). Resource acquisition allows an acquirer to buy the distinct resources (e.g. technological, marketing, green innovation) of the target firm to build up their resource base and competitiveness (Kim and Finkelstein, 2009; King, Slotegraaf and Kesner, 2008; Rhodes-Kropf and Robinson, 2008; Testoni, 2022). Conversely, resource deployment refers to deals where acquirers transfer valuable resources to increase target performance (Bauer and Friesl, 2022; Berchicci, Dowell and King, 2012). In short, acquirers select targets if there are pre-deal resource differences between merging firms.

A recently emerged M&A literature (Lu, Li and Wang, 2023; Yang and Chi, 2023) highlights green M&As as a channel for improving the green practices of polluting acquirers. In green M&A, the acquirer selects the target having green resources to improve its competitiveness and gain sustainable development (Hu, Fang and Wu, 2023; Zhao and Jia, 2022). Owing to the increasing popularity of green M&As, scholars have examined the effect of green M&As on the non-financial and financial performance of acquiring firms (Gao *et al.*, 2022; Salvi, Petruzzella and Giakoumelou, 2018; Zhao and Jia, 2022). Li *et al.* (2020) argue that heavily polluting acquirers select green targets to access green resources and decrease tax liabilities and financial constraints. Furthermore, green M&As can mitigate pollution discharging and enable firms to enter green industries (Lu, Li and Wang, 2023; Yang and Chi, 2023). On the financial side, Gomes and Marsat (2018) show that targets receive higher takeover premiums if they have environment-friendly practices. Salvi, Petruzzella and Giakoumelou (2018) also find that polluting acquirers experience an increase in financial performance after acquiring green targets. An essential feature of these studies is that the acquirer is a polluting firm and selects an environmentally sustainable target. However, we need to learn more about how acquirers select targets if they are not polluting firms and have green resources.

Role of governance and signalling in M&As

Corporate governance standards differ across firms and countries (Ellis *et al.*, 2017; Renneboog and Vansteenkiste, 2019; Wang and Xie, 2009), and these differences create the possibility of governance transfers from acquirers to targets. Studies show that acquirers earn higher returns in deals with better governance standards than did the target before the deal announcement. An acquirer realizes higher returns as they impose their governance standards on the target to improve the performance of the combined firm, especially in majority-control acquisitions. Overall, this strand of literature is based on the assumption that acquirers have better country-level or firm-level governance standards than targets.

Given the high level of information asymmetries and resource requirements, takeovers can benefit from signals (Ragozzino and Reuer, 2007). M&A literature has focused on acquirer or target signals (Humphery-Jenner, Sautner and Suchard, 2017; Wu and Reuer, 2021) to describe takeover performance. For instance, Reuer, Tong and Wu (2012) show that target firm affiliations with venture capitalists or investment banks send a positive signal to the stock market about the target firm's value. Conversely, Humphery-Jenner, Sautner and Suchard (2017) find that the acquirer's private equity ownership sends a positive signal to the stock market and such acquirers experience higher short-term and long-term takeover performance. In summary, these studies enhance our understanding of the signalling effect in the takeover market.

Theoretical perspectives

Resource-based view. The resource-based view (RBV) has gained substantial support in the M&A literature, suggesting that a firm's competitive advantage emerges from its distinct resources and capabilities (Barney, 1991; Hart, 2005). This view relies on the assumption that firm resources are heterogeneous and imperfectly mobile (Conner, 1991; Yu, Hu and Xu, 2022). For instance, firm resources such as green product and process innovation are stocks of tangible factors in a firm's possession that can play a significant role in target selection. Owing to their green resources, firms have a competitive advantage and use them to further increase their competitiveness by making investment decisions, including M&As. Scholars used RBV to elaborate on the importance of resources in M&As (King, Slotegraaf and Kesner, 2008; Puranam, Singh and Zollo, 2006; Testoni, 2022) and argue that acquirers with abundant resources can better identify their targets.

Several studies (Boone and Uysal, 2020; Chen, Li and Meng, 2017; Makri, Hitt and Lane, 2010; Maung, Wilson and Yu, 2020) emphasize that resource resemblance

between merging firms eases post-integration challenges that lead to takeover synergies. Within this realm, scholars consider the resemblance between R&D capabilities (Yu, Umashankar and Rao, 2016), technological innovation (Makri, Hitt and Lane, 2010) and production capacity (Kaul and Wu, 2016). However, some argue that complementary resources of merging firms create room for the spillover of resources from one firm to another (Harrison *et al.*, 2001; Sarala and Vaara, 2010). For instance, King, Slotegraaf and Kesner (2008) find that acquirers with marketing resources and targets with technological resources complement one another and create a competitive advantage for the combined firm. Also, Hussain, Saeed and Riaz (2024) find that acquirers select targets with different levels of reputational risk when entering new markets, suggesting that reputational risk disparity determines value creation in new market M&As. Although existing studies enhance our understanding of the significance of resources in takeovers, they do not give insights into how the acquirer's green innovation plays a role in the target selection.

Information asymmetry perspective. The information economics literature suggests that takeover decisions are complex owing to high information asymmetry between merging firms (Cuypers, Cuypers and Martin, 2017; Dow, Cuypers and Ertug, 2016; Reuer and Ragozzino, 2008). This has implications for both acquirers and targets. On the one side, acquirers tackle challenges in evaluating the actual value of targets' assets, and targets may conceal bad information to increase their perceived value (Luypaert and Van, 2017; Reddy and Fabian, 2020). The absence of accurate information about target assets may lead acquirers to overpay in the bargaining (Coff, 1999; Hussain and Loureiro, 2023), as targets will take advantage of hidden information. Conversely, targets without any intention of hiding bad information may struggle to devolve credibly into the actual value of their assets during bargaining (Reuer, Tong and Wu, 2012; Song, Zeng and Zhou, 2021).

Hansen (1987) contends that a lemons problem appears in M&As if the target firm holds essential information regarding its true value. The target firm accepts a deal offer when the acquirer pays more than its actual value. The acquirer can secure itself against adverse selection problems by engaging in due diligence (Chakrabarti and Mitchell, 2013), which allows it to collect maximum information about the target (Luypaert and Caneghem, 2017). During the negotiation process, the target's management may allow acquirers to access inside information and management accounts (Raman, Shivakumar and Tamayo, 2013) if the target expects synergy gains whereby innovative resources of the acquirer are shared with the target after the takeover (King, Slotegraaf and Kesner, 2008). Therefore, the potential of sharing innovative resources with targets creates stronger bargaining power and a competitive advantage for resource-rich firms over resource-poor firms.

Hypotheses development

Green acquirer's target selection. Green innovation is an important resource as it is valuable, non-substitutable, rare and inimitable as per the RBV framework (Tan *et al.*, 2018), eventually providing a competitive advantage to acquiring firms. The valuable and rare attributes of green innovation empower firms with a competitive advantage over non-green counterparts, while the inimitable and non-substitutable attributes enable these firms to sustain this competitive advantage over the long run (Farza *et al.*, 2021; Laffont and Tirole, 1996; Tan *et al.*, 2018). Thus, as an essential firm resource, green innovation permits holders to gain and sustain a competitive advantage (Cainelli, De Marchi and Grandinetti, 2015; Li, 2014). Firms with green resources may have specific preferences when selecting targets to maintain their competitiveness. To that end, we examine whether green acquirers select targets with lower information asymmetries – publicly listed targets and targets from a related industry – to avoid the risk of value-destructive deals. Being competitive, green acquirers may not face intense competition among potential acquirers and can attract targets to disclose accurate information.

An important differentiation between publicly listed and private firms is the quantity and quality of available information. In the M&A context, publicly listed targets are more visible or transparent owing to disclosure requirements and updated stock prices, whereas private targets are less transparent (Capron and Shen, 2007; Moussa, Kotb and Helfaya, 2022; Officer, Poulsen and Stegemoller, 2009; Reuer and Ragozzino, 2008; Song, Zeng and Zhou, 2021). Second, in related industry deals, acquirers can better identify the asset value of public targets (Borochin, Ghosh and Huang, 2019; Perafan-Pena, Gill-De-Albornoz and Giner, 2022) owing to business closeness and frequent information sharing through industry conferences, networking events and CEO-level meetings (Raman, Shivakumar and Tamayo, 2013). Thus, it is easier to assess the actual value of targets with lower information asymmetries.

Employing theoretical arguments from the RBV and information asymmetry perspective, we argue that green firms engage in M&As to sustain competitive advantage and may select targets with lower information asymmetries. Under lower information asymmetries, assessing the actual value of target resources and avoiding overpayment risk becomes easier, leading to better takeover performance. This leads to the following hypothesis:

Hypothesis 1. *Green acquirers are more likely to buy public targets from the related industry, ceteris paribus*.

Board characteristics and takeover experience. The role of corporate governance standards is well documented in the M&A literature (Ellis *et al.*, 2017; Wang and Xie, 2009) and suggests that acquirers with better governance than the target can earn positive announcement returns. We argue that the green acquirer's potential for collecting information (mainly private) about the target should be more pronounced if they have board networks, a better monitoring environment (i.e. independent and gender-diverse boards) and the takeover experience. This is so because board networks increase access to information that firms can use in decision-making (Omer, Shelley and Tice, 2014). Directors' indirect and direct ties influence their information collection and the proper target selection (Horton, Millo and Serafeim, 2012). Also, networks assist directors in getting information about sector trends, economic evolutions and the corporate strategies of other firms (Renneboog and Zhao, 2014). Cai and Sevilir (2012) show that information asymmetries are lower in the presence of joint directors between acquirers and targets. Thus, firms can use networks for better information access to find the actual value of targets.

Higher governance limits the ability of acquirer managers to engage in empire-building behaviour and to work in the best interest of shareholders (Ellis *et al.*, 2017; Wang and Xie, 2009). Among several internal governance mechanisms, board structure plays a pivotal role in ensuring takeover success (Adams and Mehran, 2012; Defrancq, Huyghebaert and Luypaert, 2021). Importantly, independent directors are more successful in monitoring and controlling management (De Andres, Azofra and Lopez, 2005; García-Sánchez *et al.*, 2019) and can improve objectivity and independence dimensions in decision-making (Fama and Jensen, 1983; Poletti-Hughes and Briano-Turrent, 2019). Considering target selection, diligence is an independent and objective examination of the target firm (Angwin, 2001) that may only be possible if the directors are independent.

Further, a greater level of monitoring by female directors is driven by their willingness to make alliances (Huse and Solberg, 2006), their relational abilities (Galbreath, 2018), risk aversion (Biswas, 2021) and attendance at meetings (Srinidhi *et al.*, 2020). Female directors are conservative in takeover decisions and use their relational abilities to mitigate information asymmetries about the target firm (Gunasekarage *et al.*, 2023). Female directors extensively scrutinize the target before finalizing the deal (Croson and Gneezy, 2009), and this process can be more meaningful if the acquirer selects the target carefully.

Finally, the importance of the acquirer's prior takeover experience is well documented, and the experience results in better acquisition outcomes (Chao, 2018; Laamanen and Keil, 2008). Takeover experience helps acquirers improve their capabilities regarding deal negotiation and target selection (Aktas, De Bodt and Roll, 2011; Renneboog and Vansteenkiste, 2019). Acquirers with takeover experience are more likely to carefully search when selecting targets, as, being experienced negotiators, they may want more information. In short, these board characteristics and takeover experience would help green acquirers gather target information more accurately. Based on these arguments, we present the second hypothesis as follows:

Hypothesis 2. *Green acquirers are more likely to buy public targets from related industries if they have board networks, independent and gender-diverse boards, and takeover experience, ceteris paribus*.

Acquirer returns in M&As. Extensive research on M&As suggests that acquirers rarely earn positive returns. The higher gains to acquirers depend on their governance standards (Ellis *et al.*, 2017), bargaining power (Hussain *et al.*, 2022; Lee, 2018) and deal characteristics (Tunyi, 2021). For instance, Hussain *et al.* (2022) argue that powerful acquirers generate higher shareholder returns by negotiating better terms and paying fair premiums. We propose that green innovation provides a competitive advantage to focal firms and enables them to realize higher announcement returns owing to better bargaining power, right target selection and higher potential of resource transferability.

First, we claim that green innovation can increase the bargaining power of the acquirer relative to the target and potential acquirers. As M&A is a bargaining process, acquirers with green resources may face fewer competing acquirers and be more attractive to lesser or non-innovative targets. Eventually, green acquirers might generate higher returns owing to their higher bargaining power, and this argument is consistent with other M&A studies documenting the role of bargaining power (Alexandridis, Petmezas and Travlos, 2010; Hussain and Loureiro, 2023). Second, we propose that green acquirers might be more efficient in the target selection owing to their innovative resources and reputation. Bena and Li (2014) argue that innovative acquirers are better positioned to reduce information asymmetries. Therefore, we enunciate that green acquirers can be more cautious about takeover success and engage in due diligence to realize higher returns. Finally, we propose that acquirers with green resources can transfer such resources to targets after the successful deal. This transferability potential attracts targets, especially those lacking in green resources. Our argument is aligned with Capron and Pistre (2002), who show that acquirers earn higher returns in deals of resources transferability from acquirers to

Table 1. Sample distributions

Year	Number of deals	Percentage	Industry (top ten)	Number of deals	Percentage	Acquirer country	Number of deals	Percentage
2005	487	6.25	Electronic equipment	955	12.26	Australia	116	1.49
2006	581	7.46	Business services	864	11.09	Austria	55	0.71
2007	561	7.20	Measuring and control equipment	485	6.23	Belgium	53	0.68
2008	559	7.18	Computers	483	6.20	Brazil	76	0.98
2009	454	5.83	Telecommunications	482	6.19	Canada	411	5.28
2010	593	7.61	Restaurants, hotels, motels	368	4.73	Chile	17	0.22
2011	667	8.56	Pharmaceutical products	325	4.17	China	16	0.21
2012	643	8.26	Medical equipment	300	3.85	Denmark	31	0.40
2013	519	6.66	Machinery	282	3.62	Finland	136	1.75
2014	620	7.96	Retail	255	3.27	France	597	7.67
2015	631	8.10				Germany	525	6.74
2016	669	8.59				Greece	15	0.19
2017	157	2.02				India	42	0.54
2018	194	2.49				Italy	36	0.46
2019	189	2.43				Japan	243	3.12
2020	164	2.11				Malaysia	7	0.09
2021	100	1.28				Mexico	43	0.55
						Norway	57	0.73
						Poland	14	0.18
						Portugal	13	0.17
						Singapore	23	0.30
						Spain	98	1.26
						Sweden	170	2.18
						Switzerland	205	2.63
						United Kingdom	169	2.17
						United States	4620	59.32
Total	7788	100.00		4799	61.62		7788	100.00

Note: This table shows M&A sample distributions by deal announcement year, acquirer industry, and acquirer country. The sample comprises 7788 global M&As reported in the Securities Data Corporation (SDC) from 2005 to 2021.

targets. Based on these three arguments, we develop the following hypothesis:

Hypothesis 3. *Green acquirers buying public targets from related industries earn higher returns, ceteris paribus*.

Data and methodology

Data

Following existing M&A studies (Ahmad, Aktas and Aziz, 2023; Chaudhry, Kontonikas and Vagenas-Nanos, 2022; Tunyi, 2021; Wang and Xie, 2009), we used the Securities Data Corporation (SDC) database to obtain M&A data from 2005 to 2021. We get deal-related information from SDC, such as the number of competing acquirers, merging firms' industry (related or unrelated), method of payment (cash, stock or mixed), target status (public or private) and takeover premium. We consider completed deals by publicly listed acquirers so that we can examine acquirers' returns around the deal announcement. Owing to their different regulations, we drop deals by acquirers from financials and utilities. We exclude deals from acquirer countries with fewer than five deals during the sample period to avoid noise in our regression analyses.[2]

The data on green innovation is from the ASSET4 ESG database, which is widely used for environmental, social and governance standards (Drempetic, Klein and Zwergel, 2020; Hussain and Shams, 2022; Mervelskemper and Streit, 2017). We match SDC data with ASSET4 ESG data using the SEDOL code as a common identifier and exclude all deals where information on green innovation is missing. Stock price and accounting information are from Thomson Reuters' DataStream and WorldScope, respectively. Acquirers' home country characteristics, including gross domestic product (GDP) growth and GDP per capita, come from the World Bank website (i.e. World Development Indicators). The final data comprise 7788 M&A deals across 26 acquirer countries.

[2]The initial sample consists of 18,797 completed M&A deals. We excluded 1034 deals where the acquirer is either from the financials and utilities industry or a country with fewer than five deals, 7569 deals were excluded where either stock price data during the event window or green innovation data were missing, and 2406 deals were dropped for which information on control variables was missing.

Table 1 shows the sample distributions by deal announced year, acquirer industry and acquirer country. The dominant years in the international takeover activity are 2016 (669 deals, representing 8.59% of the sample), 2011 (667 deals, equivalent to 8.56% of the sample), and 2012 (643 deals, which is 8.26% of the sample). In general, we see a mixed trend in the global takeover activity. The most active industries in our sample include electronic equipment (955 deals, contributing 12.26%), business services (864 deals, contributing 11.09%) and measuring and control equipment (485 deals, contributing 6.23%). As expected, the United States showed the highest number of deals (4620, equivalent to 59.32% of the sample) during the sample period.

Table 2 manifests descriptive statistics of involved variables, along with differences in means for green innovative and non-innovative acquirers using both proxies (i.e. high product innovation and high process innovation). Panel A reports that acquirers buying public targets and targets from related industries account for 36.1% (0.361 × 100) and 66.9%, respectively. The average 3-day, 5-day and 51-day CARs are 0.010, 0.013 and 0.040, respectively. The mean differences between innovative and non-innovative acquires among all these variables are statistically significant. Panel B shows that average high product and process innovation values are 0.17 and 0.14, respectively. We observe significant dispersion among all variables used in our regression analyses.[3] Overall, the economic magnitudes of target choices and returns are comparable to those in other studies (Faccio, McConnell and Stolin, 2006; Gunasekarage *et al.*, 2023; Hussain *et al.*, 2022; Tunyi, 2021).

Methodology

Independent variable: green innovation. As mentioned above, our data on green innovation is from the ASSET4 ESG database. It defines green innovation as: 'a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed products'. This database provides scores for various green innovation-related attributes, which are presented with their detailed definitions and assigned categories in Appendix B. We developed indices for product and process innovation (dimensions of green innovation) based on individual attributes. To identify green acquirers, we used two dummy variables (high product innovation and high process innovation) that take the value of one if the index score is above the sample median and zero otherwise.

Dependent variables: target status, target industry and acquirer returns. Our key dependent variables include target status (public or private) and target industry (related or unrelated), which reflect the target selections of green acquirers. Both target choices are dummy variables, with values of one if the acquirer buys the publicly listed target, the acquirer and target are from the same Fama-French 48 industrial category, and zero otherwise. We calculated acquirers' cumulative abnormal returns (CARs) using event study methodology to examine how these selections create value for acquirer shareholders. We estimate expected returns employing the following market model:

$$R_{\mathrm{gct}} = \alpha_{\mathrm{gc}} + \beta_{\mathrm{gc}} MR_{\mathrm{ct}} + \varepsilon_{\mathrm{gct}}, t = -255, \ldots, -25, \quad (1)$$

where R_{gct} is the daily stock return for acquiring firm g in country c; MR_{ct} presents DataStream's daily market return index for county c; and $\varepsilon_{\mathrm{gct}}$ shows the acquirer's excess or abnormal return. CARs are the differences between expected and realized returns for a 3-day event window.[4]

Control variables. We use several control variables, including acquirer characteristics, deal features and acquirer country characteristics, that may affect target selection and acquirer returns.[5]

We control for four acquirer characteristics, including cash flows (Martynova and Renneboog, 2008), leverage (Lang, Stulz and Walkling, 1991), firm size (Moeller, Schlingemann and Stulz, 2004) and profitability (Boubakri *et al.*, 2016). Higher leverage reduces managerial hubristic behaviour and incentivizes managers to increase acquirer returns (Wang and Xie, 2009). Jensen (1986) suggests that firm managers with abundant cash flows buy poorly performing targets and decrease shareholder wealth. The acquirer's firm size can affect both target selection (Wang and Zajac, 2007) and returns (Karampatsas, Petmezas and Travlos, 2014; Moeller, Schlingemann and Stulz, 2004), as bigger firms have specific takeover choices and pay higher takeover premiums for winning the bid. Firms with higher profitability select targets that have growth potential for creating takeover benefits (Boubakri *et al.*, 2016; Palepu, 1986).

Higher takeover competition among potential acquirers can affect target selection and acquirer return (Alexandridis, Petmezas and Travlos, 2010; Hussain and Loureiro, 2023). In the presence of greater asymmetric information between merging firms, acquirers prefer cash payments to targets for getting benefits from the

[3] We report Pearson's correlation matrix in Appendix C.

[4] We present the conceptual framework in Appendix D.

[5] Jensen and Ruback (1983) and Martynova and Renneboog (2008) elaborate key determinants of takeovers and financial outcomes.

Table 2. Descriptive statistics

	Full sample						Green acquirer	
							High product innovation	High process innovation
	N	Mean	Median	Standard deviation	5th percentile	99th percentile	Difference (*t*-test)	Difference (*t*-test)
Panel A: Target selection and takeover performance								
Public target	7788	0.361	0.000	0.480	0.000	1.000	0.139***	0.120***
Related industry target	7788	0.669	1.000	0.471	0.000	1.000	0.040***	0.031*
3-day CARs	7788	0.010	0.007	0.030	−0.032	0.113	0.004***	0.003***
5-day CARs	7788	0.013	0.011	0.037	−0.044	0.137	0.007***	0.006***
51-day CARs	7788	0.040	0.036	0.118	−0.140	0.381	0.030***	0.026***
Panel B: Green innovation								
High product innovation	7788	0.170	0.000	0.376	0.000	1.000		
High process innovation	7788	0.144	0.000	0.351	0.000	1.000		
Panel C: Board characteristics and takeover experience								
Board network	7788	0.365	0.000	0.482	0.000	1.000	0.301***	0.290***
High board independence	7788	0.515	1.000	0.500	0.000	1.000	0.033***	0.068***
High gender diversity	7788	0.496	0.000	0.500	0.000	1.000	0.085***	0.011
Takeover experience	7788	0.218	0.000	0.413	0.000	1.000	0.773***	0.756***
Panel D: Firm characteristics								
Leverage	7788	0.170	0.158	0.136	0.000	0.540	−0.085***	−0.092***
Profitability	7788	2.642	0.093	5.769	0.028	18.33	−3.057***	−2.974***
Firm size	7788	16.01	15.933	1.451	13.702	18.364	0.492***	0.540***
Cash flow	7788	0.079	0.075	0.068	−0.014	0.277	0.013***	0.015***
Panel E: Deal characteristics								
Competing acquirers	7788	1.024	1.000	0.282	1.000	1.000	−0.022***	−0.021***
Cash-financed deal	7788	0.74	1.000	0.438	0.000	1.000	−0.501***	−0.457***
Panel F: Country characteristics								
GDP growth	7788	1.877	2.250	1.991	−2.537	6.869	0.893***	0.794***
Log GDP per capita	7788	10.73	10.778	0.393	10.426	11.352	−0.086***	−0.067***

Note: The table presents summary statistics of the variables involved in this study. The sample is composed of 7788 global M&As from 2005 to 2021. In Panel A, the public target is a dummy variable with a value of one when the target is a publicly listed firm and zero otherwise. Also, the related industry target is a dummy variable equal to one if the target is from the same industry as the acquirer and zero otherwise. 3-day, 5-day and 51-day CARS are acquirer cumulative abnormal returns (CARs) calculated using the market model. Our key variable of interest (Panel B) is the acquirer's level of green innovation, measured using scores provided by the ASSET4 ESG database under the environment pillar. We assigned product or process innovation categories based on the detailed definition of a particular attribute. High product or process innovation is a dummy variable that equals one if the acquirer's level of innovation under assigned categories is above the sample median and zero otherwise. Panel C shows descriptive statistics for our key moderators, including board network (a dummy variable with the value of one if the acquirer and target have common directors and zero otherwise), high board independence (a dummy variable having a value of one if the acquirer's board independence is above the sample median and zero otherwise) and takeover experience (a dummy variable that has a value of one if the acquirer engages in more than three M&A deals during the sample period and zero otherwise). Acquirer firm characteristics include leverage, long-term debt scaled by total assets; profitability, the ratio of earnings before interest and tax (EBIT) to capital employed; firm size, natural logarithm of total assets; cash flow, operational cash flows minus capital expenditures, all scaled by total assets. Deal and acquirer country characteristics include competing acquirers, the total number of competing acquirers in a deal; cash-financed deal, a dummy variable with a value of one if the acquirer fully pays in cash and zero otherwise; gross domestic product (GDP) growth, real GDP growth per year; log GDP per capita, natural logarithm of (real GDP/average population). The sources of all variables are mentioned in Appendix A.

takeovers (Klitzka, He and Schiereck, 2022). To avoid the higher information asymmetries associated with private targets, acquirers prefer public targets to private targets (Capron and Shen, 2007). However, M&As of private target firms produce higher returns for acquirers (Fuller, Netter and Stegemoller, 2002). Existing studies show that an acquirer's payment in stock negatively affects returns owing to adverse selection problems (Myers and Majluf, 1984). Following Ahmad, Aziz and Dowling (2022), we also used GDP growth and GDP

per capita as country characteristics affecting target selection and returns.

Estimated models. We employed the following probit model to test the first hypothesis:

$$Pr(TARSELECTION)_{d,t} = \alpha + \beta_1 GA_{d,t-1} + \sum \beta_x Firm\ controls_{a,t-1} + \sum \beta_y\ Deal\ controls_{d,t} + \sum \beta_z Country\ controls_{c,t-1} + \lambda_t + \eta_i + \gamma_c + \varepsilon_{i,t}, \quad (2)$$

where, in separate regressions, $TARSELECTION_{d,t-1}$ is a binary variable with the value of one if (1) the target is a publicly listed firm and (2) it operates in a related industry to the acquirer, and zero otherwise for deal *d* at time *t*; α shows the intercept; and $GA_{d,t-1}$ is our key independent variable (dummy) that equals one when the acquirer's green innovation score, proxied by product and process innovation indices, is above the sample median and zero otherwise. $Firm\ controls_{a,t-1}$ represents a vector of acquiring firm characteristics that includes leverage (long-term debt/total assets), profitability (earnings before interest and tax [EBIT]/capital employed), cash flows (operational cash flows minus capital expenditures, scaled by total assets), and size (natural logarithm of assets), with all of them computed 1 year before the deal announcement.

$Deal\ controls_{d,t}$ represents a vector of deal features including the number of competing acquirers; and payment method, a dummy variable with the value of one when the deal is purely financed in cash and zero otherwise. $Country\ controls_{c,t-1}$ is a vector of the acquiring firm's country characteristics, including log GDP per capita and GDP growth. To control for omitted factors that may influence our dependent variables, we add year (λ_t), industry (η_i) and country (γ_c) dummies. We also winsorize all continuous variables by 1% of the distribution tails to minimize the impact of outliers.

To test the second hypothesis, we used the following probit model:

$$Pr(TARSELECTION)_{d,t} = \alpha + \beta_1 GA_{d,t-1} + \beta_2 BC\ or\ TE_{d,t-1} + \beta_3 GA_{d,t-1} \times BC\ or\ TE_{d,t-1} + \sum \beta_x Firm\ controls_{a,t-1} + \sum \beta_y\ Deal\ controls_{d,t} + \sum \beta_z Country\ controls_{c,t-1} + \lambda_t + \eta_i + \gamma_c + \varepsilon_{i,t} \quad (3)$$

where, in separate regressions, *BC* represents board characteristics, including board network (dummy variable that equals one if the acquirer and the target have common directors and zero otherwise), board independence (dummy variable having a value of one for an acquirer with above-median board independence and zero otherwise), board gender diversity (dummy variable that equals one for an acquirer with a gender-diverse board and zero otherwise), and *TE* represents takeover experience (dummy variable with a value of one if the acquirer engages in more than three M&A deals during the sample period and zero otherwise). Our variable of interest here is the interaction term [$GA_{d,t-1} \times BC\ or\ TE_{d,t-1}$] between board characteristics or takeover experience and green acquirers. We used the following cross-sectional regression model to test our third hypothesis:

$$CAR(-1,+1)_{d,t} = \alpha + \beta_1 GA_{d,t-1} + \sum \beta_x Firm\ controls_{a,t-1} + \sum \beta_y\ Deal\ controls_{d,t} + \sum \beta_z Country\ controls_{c,t-1} + \lambda_t + \eta_i + \gamma_c + \varepsilon_{i,t}, \quad (4)$$

where $CAR\ (-1,+1)_{d,t}$ is the acquirer's 3-day CARs, and all explanatory variables are the same as in Equation 1. We also used 5-day and 51-day CARs to estimate this model for subsamples of public versus private targets and related versus non-related industries.

Empirical findings

Green acquirer's target selections

We estimate Equation 2 to investigate the target selections of green acquirers and show our results in Table 3. In Model (1), we use the first proxy of green acquirers – high product innovation – and find that green acquirers are more likely (43.1%) to acquire publicly listed targets than non-green acquirers. Model (2) shows that green acquirers are more likely (20.9%) to select the target firm from the related industry. In Models (3) and (4), we find qualitatively similar results when using high process innovation as a proxy of green acquirer. Overall, these results confirm that green acquirers prioritize lower information asymmetries to avoid risks associated with private targets and diversified deals. Among the controls, we find that firm size and cash-financed deals positively affect target selections.

The results support the importance of information symmetries in M&As, showing that green acquirers select targets considering the level of information asymmetries. We contribute to the literature on target selection (Capron and Shen, 2007; Kaul and Wu, 2016; Yu, Umashankar and Rao, 2016) by showing that green acquirers carefully select their targets. Importantly, our findings are in contrast with other studies on target selection in green M&As (Lu, Li and Wang, 2023; Salvi, Petruzzella and Giakoumelou, 2018; Yang and Chi, 2023) and suggest that, apart from the environmental sustainability of the target, the acquirer's level of green innovation also plays a vital role in the target selection. We attribute our findings to the RBV (Barney, 1991; Hart, 2005) and information asymmetry perspec-

Table 3. Green acquirers and takeover choices

	High product innovation		High process innovation	
Dependent variable	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry
Green acquirer	0.431***	0.209***	0.289***	0.187***
	(7.199)	(3.306)	(4.734)	(2.902)
Leverage	0.178	−0.213*	0.165	−0.204
	(1.366)	(−1.646)	(1.265)	(−1.571)
Profitability	0.001	−0.010***	0.001	−0.010***
	(0.388)	(−3.198)	(0.291)	(−3.153)
Firm size	0.101***	0.041***	0.102***	0.041***
	(7.629)	(3.083)	(7.726)	(3.060)
Cash flow	0.284	0.271	0.277	0.282
	(1.037)	(0.996)	(1.010)	(1.035)
Number of competing acquirers	−0.121*	0.028	−0.118*	0.028
	(−1.765)	(0.521)	(−1.717)	(0.529)
Cash-financed deal	0.179***	0.073*	0.132***	0.057
	(4.180)	(1.653)	(3.172)	(1.331)
Public target		−0.161***		−0.157***
		(−4.717)		(−4.612)
Related industry deal	−0.158***		−0.154***	
	(−4.615)		(−4.503)	
GDP growth	−0.017	−0.036*	−0.014	−0.034*
	(−0.973)	(−1.945)	(−0.795)	(−1.836)
Log GDP per capita	−0.093	−0.436*	−0.148	−0.461**
	(−0.412)	(−1.858)	(−0.650)	(−1.963)
Constant	−0.389	4.592*	0.318	4.907*
	(−0.157)	(1.796)	(0.128)	(1.919)
Year, industry and country dummies	Yes	Yes	Yes	Yes
N	7788	7788	7788	7788
Pseudo R^2	0.0978	0.1088	0.0949	0.1085

Note: The table reports results for the probabilities of green acquirers buying publicly listed targets from related industries using an international sample of 7788 M&As announced between 2005 and 2021. High product or process innovation (key variables of interest) is a dummy variable that equals one if the acquirer's level of innovation under assigned categories is above the sample median and zero otherwise. The public target is a dummy variable with a value of one if the target is a publicly listed firm and zero otherwise. The related industry target is a dummy variable with a value of one if the target is from the same industry as the acquirer. Leverage is computed as long-term debt divided by total assets; profitability is the ratio of earnings before interest and tax (EBIT) to employed capital; firm size is the natural logarithm of assets; and cash flows are calculated as (operational cash flows – capital expenditures)/total assets. The number of competing acquirers shows the total number of acquirers competing with each other in an M&A deal; the cash-financed deal is a dummy variable that takes the value of one if the acquirer pays purely in cash and zero otherwise. GDP per capita is calculated as the logarithm of (real GDP/average population), and GDP growth is real growth in GDP per annum. All continuous variables are winsorized by 1% of their tail distributions. *, ** and *** represent statistical significance levels at 10%, 5% and 1%, respectively. For heteroscedasticity, we use White's (1980) robust standard errors; *t*-statistics are in parentheses. All probit models include year, industry and country dummies.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

tive (Capron and Shen, 2007; Cuypers, Cuypers and Martin, 2017) and argue that green acquirers have a competitive advantage, prefer lower information asymmetries in the target selection, and engage in a due diligence process. In short, we show that green innovation is a distinct firm resource that provides a competitive advantage, and, to sustain this advantage, green acquirers prefer targets with lower information asymmetries.

Role of board characteristics and takeover experience

Next, we examine the potential boundary conditions under which green acquirers demonstrate specific target selections. To that end, we consider three board characteristics (board network, board independence, board gender diversity) and prior takeover experience. We argue that the potential of gathering accurate information about the target resources should be pronounced under certain board characteristics and takeover experience. To gauge the impact of these board characteristics and takeover experience on target selections of green acquirers, we estimate Equation 3. In all models from (1) to (4) of Table 4, we find that green acquirers, compared with non-green acquirers, are more likely to acquire public targets from related industries. For instance, considering Model (1) of Panel A, the coefficient on the interaction term between the board network and green ac-

Table 4. Boundary conditions – board characteristics and takeover experience

Panel A: Board network	High product innovation		High process innovation	
	(1)	(2)	(3)	(4)
Dependent variable	Public target	Related industry	Public target	Related industry
Green acquirer (GA)	0.182**	−0.021	−0.015	0.065
	(2.281)	(−0.275)	(−0.174)	(0.766)
Board network (BN)	0.212***	0.128***	0.227***	0.101**
	(4.745)	(3.073)	(5.276)	(2.333)
GA × BN	0.289***	0.191**	0.389***	0.164*
	(3.278)	(2.212)	(4.138)	(1.697)
Control variables	Yes	Yes	Yes	Yes
Year, industry, and country dummies	Yes	Yes	Yes	Yes
N	7788	7788	7788	7788
Pseudo R^2	0.1041	0.0299	0.1028	0.1100
Panel B: Board independence	High product innovation		High process innovation	
	(1)	(2)	(3)	(4)
Dependent variable	Public target	Related industry	Public target	Related industry
Green acquirer (GA)	0.277***	0.068	0.055	0.022
	(3.636)	(0.866)	(0.675)	(0.267)
High Board Independence (HBI)	0.040	0.039	0.029	0.041
	(1.029)	(1.019)	(0.777)	(1.076)
GA × HBI	0.271***	0.263***	0.389***	0.292***
	(3.277)	(3.007)	(4.370)	(3.129)
Control variables	Yes	Yes	Yes	Yes
Year, industry, and country dummies	Yes	Yes	Yes	Yes
N	7788	7788	7788	7788
Pseudo R^2	0.0995	0.1103	0.0974	0.1101
Panel C: Board gender diversity	High product innovation		High process innovation	
	(1)	(2)	(3)	(4)
Dependent variables	Public target	Related industry	Public target	Related industry
Green acquirer (GA)	0.091	0.100	−0.010	0.074
	(1.150)	(1.238)	(−0.123)	(0.914)
High Board Gender diversity	0.153***	0.110*	0.157***	0.101*
(HBGD)	(2.847)	(1.933)	(2.883)	(1.766)
GA x HBGD	0.558***	0.185**	0.543***	0.214**
	(6.493)	(2.056)	(5.850)	(2.185)
Control variables	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes
N	7788	7788	7788	7788
Pseudo R^2	0.1053	0.1101	0.1016	0.1098
Panel D: Takeover experience	High product innovation		High process innovation	
	(1)	(2)	(3)	(4)
Dependent variables	Public target	Related industry	Public target	Related industry
Green acquirer (GA)	−0.165	−0.093	−0.257**	−0.199*
	(−1.409)	(−0.832)	(−1.970)	(−1.731)
Takeover experience (TE)	0.169**	0.100	0.326***	0.079
	(2.304)	(1.314)	(4.922)	(1.208)
GA × TE	0.577***	0.294**	0.428***	0.295**
	(4.278)	(2.235)	(2.989)	(2.263)
Control variables	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes
N	7788	7788	7788	7788
Pseudo R^2	0.1027	0.1103	0.1008	0.0281

Table 4. (Continued)

Note: This table shows results for target selections of green acquirers when the acquirer has a board network, board independence, board gender diversity and prior takeover experience. Board network (Panel A), high board independence (Panel B), and high board gender diversity (Panel C) are dummy variables with values of one if the acquirer and target have common directors, the acquirer has above sample-median board independence, and the acquirer has above sample-median gender diversity, respectively. Takeover experience (Panel D) is a dummy variable that equals one when the acquirer engages in more than three M&A deals during the sample period and zero otherwise. High product or process innovation (key variables of interest) is a dummy variable that equals one if the acquirer's level of innovation under assigned categories is above the sample median and zero otherwise. Our dependent variables include the public target, a dummy variable with a value of one if the target is a publicly listed firm and zero otherwise; and the related industry target, a dummy variable with a value of one if the target is from the same industry as the acquirer. All control variables are the same as in the previous table and are defined in Appendix A. We winsorized continuous variables by 1% of their tail distributions. *, ** and *** represent statistical significance levels at 10%, 5% and 1%, respectively. For heteroscedasticity, we use White's (1980) robust standard errors; *t*-statistics are in parentheses. All probit models include use year, industry and country dummies.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

quirer [GA × BN] is positive and statistically significant at 1%. Our results corroborate the second hypothesis, showing that board independence, board gender diversity and takeover experience are moderators for the target selections of green acquirers.

The findings suggest that common directors between the acquirer and target firm increase the potential of obtaining more accurate information about the target firm and support the role of board networks (Larcker, So and Wang, 2013; Omer, Shelley and Tice, 2014; Renneboog and Zhao, 2014). A better monitoring environment under the supervision of independent board members (Angwin, 2001; Moursli, 2020; Poletti-Hughes and Briano-Turrent, 2019) and gender-diverse board (Biswas, 2021; Gunasekarage *et al.*, 2023) ensures that green acquirers carefully engage in due diligence by collecting maximum information about the target firm. Further, we add to the literature on takeover experience (Chao, 2018; Laamanen and Keil, 2008) by showing that green acquirers' takeover experience helps them evaluate the target in a better way as experienced acquirers can capitalize on their earlier experiences with M&As. Overall, we show that green acquirers select targets under lower information asymmetries and that the potential of collecting more information intensifies under certain conditions.

Target selections of green acquirers and returns

Considering our third hypothesis, we propose that green acquirers, compared with non-green acquirers, can earn higher returns owing to competitive advantage and better evaluation of target resources. To estimate Equation 4, we split our sample into four subsamples of public versus private target and related versus non-related industry deal, and report results from cross-sectional regressions in Table 5. The results from Panel A show that green acquirers earn higher returns if they acquire publicly listed targets from related industries. In contrast, green acquirers do not earn significant returns if they buy private targets from non-related industries. Considering Model (1) of Panel A, green acquirers earn 0.7% more returns than non-green acquirers. In Panels B and C, we also find that green acquirers, on average, earn higher 5-day and 51-day returns than their non-green counterparts.

The results suggest that, apart from acquirers' governance (Ellis *et al.*, 2017), CSR (Hussain and Shams, 2022) and deal characteristics (Tunyi, 2021), their returns also depend on green resources. Our findings are aligned with earlier work on acquirer resources (Capron and Pistre, 2002), bargaining power (Ahern, 2012; Hussain *et al.*, 2022) and the transferability of resources (King, Slotegraaf and Kesner, 2008; Puranam, Singh and Zollo, 2006; Testoni, 2022). We show that the target selections of green acquirers have value implications that highlight financial outcomes emerging from competitive advantage and lower information symmetries. Green acquirers have a competitive advantage, carefully collect target information, and bargain on better terms to generate positive returns. We suggest that higher bargaining power emerges from green innovation, such that green acquirers can bargain more effectively than non-green acquirers.

Addressing endogeneity

Sample selection bias. To address potential endogeneity concerns related to sample selection bias, we followed existing studies (Bose, Minnick and Shams, 2021; Hussaini, Rigoni and Perego, 2023) and used propensity score matching (PSM). It is possible that firms with specific characteristics that affect target selection may also be susceptible to acquiring private targets from unrelated industries; therefore, what we attribute to green innovation may be driven by some other factors. To address this concern, we used one-to-one matching to determine pairs of comparable M&As from the low and high groups of green innovation. In Panels A and B of Table 6, we re-estimate Equations 2 and 4 employing the matched sample and find similar results to in Tables 3 and 5.

Table 5. Green acquirers' announcement returns

Panel A: 3-day returns	High product innovation		High process innovation		High product innovation		High process innovation	
Dependent variable: CARs [−1, +1]	(1) Public target	(2) Related industry	(3) public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.007***	0.004***	0.005**	0.003*	0.001	0.003	−0.001	−0.000
	(3.478)	(2.795)	(2.529)	(1.818)	(0.666)	(1.275)	(−0.335)	(−0.053)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	5209	2808	5209	4980	2579	4980	2579
R^2	0.080	0.062	0.078	0.062	0.056	0.085	0.056	0.085
Panel B: 5-day returns	**High product innovation**		**High process innovation**		**High product innovation**		**High process innovation**	
Dependent variable: CARs [−2, +2]	(1) Public target	(2) Related industry	(3) public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.006**	0.004**	0.005*	0.004**	0.003	0.005	0.002	0.001
	(2.196)	(2.327)	(1.908)	(1.967)	(1.575)	(1.549)	(1.126)	(0.397)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	5209	2808	5209	4980	2579	4980	2579
R^2	0.079	0.056	0.078	0.056	0.056	0.085	0.055	0.084
Panel C: 51-day returns	**High product innovation**		**High process innovation**		**High product innovation**		**High process innovation**	
Dependent variable: CARs [−25, +25]	(1) Public target	(2) Related industry	(3) public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.021***	0.016***	0.025***	0.008	0.006	0.005	−0.009	−0.003
	(2.663)	(2.630)	(3.082)	(1.280)	(0.822)	(0.440)	(−1.275)	(−0.344)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	5209	2808	5209	4980	2579	4980	2579
R^2	0.104	0.061	0.104	0.060	0.060	0.092	0.060	0.092

Note: The table reports results for the association between green acquirers and cumulative abnormal returns (CARs) using 3-day (Panel A), 5-day (Panel B) and 51-day (Panel C) event windows. In Panel A, using the market model, we compute acquirer CARs for the event window starting 1 day prior to the deal announcement and ending 1 day after the deal [−1, +1] and an estimation window of 255 to 25 days before the deal announcement. In Panel B, we calculate green acquirer CARs for the event window starting 2 days before the deal announcement and ending 2 days after the deal [−2, +2]. In Panel C, we calculate green acquirer CARs for the event window starting 25 days before the deal announcement and ending 25 days after the deal [−25, +25]. High product or process innovation (key variables of interest) is a dummy variable that equals one if the acquirer's level of innovation under assigned categories is above the sample median and zero otherwise. All control variables are the same as in Table 3 and defined in Appendix A. We winsorized continuous variables by 1% of their tail distributions. *, ** and *** represent the level of statistical significance at 10%, 5% and 1%, respectively. For heteroscedasticity, we use White's (1980) robust standard errors; *t*-statistics are in parentheses. All regression models include use year, industry and country dummies.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Omitted variable – disparity in managerial ability. Incompetent managers may operate firms inefficiently and not adopt green practices, whereas managers of green acquirers may be more competent. To capture managerial ability, we used industry-adjusted return on equity and return on assets and re-estimated baseline models by adding disparity in managerial ability (green acquirer managerial ability minus non-green acquirer managerial ability) as an additional control variable. We still find that green acquirers have certain takeover choices to earn higher returns, and the difference in managerial ability between green and non-green acquirers does not drive these choices.

Additional analyses: Acquisition efficiency and takeover premium

If green acquirers prefer lower information asymmetry and hold a competitive advantage, they may be able to finalize the deal in a shorter period. Also, they can pay fair premiums to win the bid, and, eventually, targets may experience negative returns.[6] This is so because

[6]We dropped 4908 deals where the target is a private firm, as takeover premium and stock price data are only available for publicly listed firms.

Table 6. Endogeneity – sample selection and omitted variable bias

Panel A: Propensity score matching (PSM)	Logit model	Matched sample			
Dependent variable	(1) High green innovation	(2) Public target	(3) Related industry	(4) Public target	(5) Related industry
Green acquirer	-	0.371***	0.293***	0.296***	0.293***
		(4.751)	(3.690)	(3.686)	(3.610)
Leverage	−0.450**	0.051	−0.248	0.052	−0.226
	(−2.430)	(0.296)	(−1.412)	(0.302)	(−1.276)
Profitability	−0.010**	0.003	−0.006	0.003	−0.006
	(−2.370)	(0.639)	(−1.448)	(0.650)	(−1.339)
Other control variables	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes
N	7788	4309	4285	4309	4285
Pseudo R^2	0.0224	0.0575	0.1068	0.0559	0.1067

Panel B: PSM – matched sample regressions	High product innovation		High process innovation		High product innovation		High process innovation	
Dependent variable: CARs [−1, +1]	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.010***	0.006***	0.008***	0.009***	0.003	0.006	0.004	0.002
	(5.064)	(3.167)	(4.043)	(4.530)	(1.095)	(1.542)	(1.327)	(0.696)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2803	2807	2803	2807	1506	1502	1506	1502
R^2	0.042	0.074	0.039	0.040	0.082	0.121	0.082	0.120

Panel C: Omitted variable bias (ROA or ROE)	High product innovation		High process innovation		High product innovation		High process innovation	
	ROA				ROE			
Dependent variables	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Public target	(6) Related industry	(7) Public target	(8) Related industry
Green acquirer	0.430***	0.210***	0.288***	0.188***	0.431***	0.209***	0.289***	0.187***
	(7.182)	(3.317)	(4.716)	(2.914)	(7.193)	(3.307)	(4.734)	(2.905)
Managerial efficiency gap	−0.015	0.010	−0.017	0.010	−0.014	−0.005	−0.015	−0.005
	(−0.547)	(0.427)	(−0.609)	(0.415)	(−1.381)	(−0.890)	(−1.387)	(−0.894)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	7788	7788	7788	7788	7788	7788	7788	7788
Pseudo R^2	0.0978	0.1088	0.0949	0.1086	0.0981	0.1089	0.0952	0.1086

Panel D: Omitted variable bias (ROA or ROE)	High product innovation		High process innovation		High product innovation		High process innovation	
	ROA		ROE		ROA		ROE	
Dependent variable CARs [−1, +1]	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.007***	0.004***	0.005**	0.003*	0.001	0.004	−0.001	−0.000
	(3.444)	(2.808)	(2.480)	(1.824)	(0.745)	(1.382)	(−0.360)	(−0.063)
Managerial efficiency gap	−0.001	0.000	−0.001*	−0.000	0.002**	0.002	0.000**	0.000***
	(−0.983)	(0.383)	(−1.712)	(−1.187)	(1.980)	(1.569)	(2.176)	(4.221)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	5209	2808	5209	4980	2579	4980	2579
R^2	0.080	0.062	0.079	0.062	0.057	0.087	0.056	0.086

Table 6. (Continued)

Note: The table shows results for green acquirers' target selections and announcement returns after addressing sample selection bias and omitted variable bias. For PSM (Panels A and B), we point out the treatment group (green acquirers) that holds similar deal and firm characteristics to the control group (non-green acquirers). Panels C and D show results after addressing omitted variable bias – disparity in managerial efficiency – between green and non-green acquirers. High product or process innovation (key variables of interest) is a dummy variable that equals one if the acquirer's level of innovation under assigned categories is above the sample median and zero otherwise. Our dependent variables include the public target, a dummy variable with a value of one if the target is a publicly listed firm and zero otherwise; the related industry target, a dummy variable with a value of one if the target is from the same industry as the acquirer; and acquirer returns calculated using the market model. We winsorized continuous variables by 1% of their tail distributions. All control variables are the same as in Table 3 and defined in Appendix A. For heteroscedasticity, we use White's (1980) robust standard errors; *t*-statistics are in parentheses. *, ** and *** exhibit the level of statistical significance at 10%, 5% and 1%, respectively. All probit models include use year, industry and country dummies.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

an M&A is a bargaining process where rational acquirers want to buy the target at a fair price to make a value-enhancing deal (Bertrand, Betschinger and Settles, 2016; Hussain *et al.*, 2022) whereas the target wants to get the highest price to leave the market (Eckbo, 2009). Thus, the price negotiation is contingent on the relative bargaining power of merging firms, where the firm with higher bargaining power is more likely to achieve its objectives. We argue that because green acquirers have bargaining power, they pay a fair premium to win the bid auction. To test our conjectures, we re-estimate baseline models and show that green acquirers take less time than non-green acquirers to complete the deal[7] and pay lower premiums,[8] and that target shareholders realize negative returns around the deal announcement. These findings further support RBV and the role of information asymmetries in the international takeover market. Our results add to existing M&A studies (Hussain and Shams, 2022; Hussain *et al.*, 2022), suggesting that green acquirers collect target information by considering time efficiency and bargaining on better terms to realize higher returns (Table 7).

Robustness checks

To make our results reliable, we conduct several robustness checks, including the overall index for green acquirers, excluding dominant years, industries, and countries, adding additional controls, and controlling for external shocks. First, we dropped deals from dominant years (2011, 2012 and 2016) and dominant countries (the United States, Germany and France) to ensure they did not drive the results. Second, we add additional controls such as firm value and liquidity. Third, we control for exogenous shocks of the financial crisis of 2007–2008 and Covid-19. Fourth, we developed an overall index based on product and process innovation indices for identifying green acquirers. Finally, we divide our sample into two periods (2005–2013 and 2014–2021). In all these model specifications, we re-estimate Equations 2 and 4 and find similar results to what we found before (Table 8).

Discussion and Conclusion

Summary

This work outlines three key findings: (1) green acquirers select publicly listed targets in the related industry; (2) such target selections happen owing to board network, board independence, board gender diversity and the acquirer's takeover experience; (3) green acquirers earn higher returns after buying targets with lower information asymmetries. Our results show the role of competitive advantage and lower information asymmetries in target selection and suggest that careful target selection is an outcome of the pre-deal higher level of green innovation.

Contributions

This study contributes to the target selection literature by revealing two important aspects of the takeover market – green innovation and information asymmetries – that have been undiscovered in existing studies. Our empirical results complement some of the existing works on target selection (Capron and Shen, 2007; Cuypers, Cuypers and Martin, 2017; Kaul and Wu, 2016; Yu, Umashankar and Rao, 2016) and acquirer wealth (Fuller, Netter and Stegemoller, 2002; Hussain and Loureiro, 2023; Masulis, Wang and Xie, 2007). We emphasize that information affects both target selection and acquirer return. While empirical work exists for the differences in green resources of merging firms (Hu, Fang and Wu, 2023; Salvi, Petruzzella and Giakoumelou, 2018; Yang and Chi, 2023), the associated value of information has yet to gain much attention in the literature. Our findings highlight the critical roles of

[7]The time taken to complete the deal is measured using the natural logarithm of the difference between the deal announcement date and the effective date.

[8]Takeover premium is the ratio of the acquirer's offer price to the target's stock price 1 day, 1 week, and 4 weeks before the deal announcement.

Table 7. Additional analyses – Acquisition efficiency and takeover premium

Panel A: Acquisition efficiency

Dependent variable: Log days	(1) High product innovation	(2) High process innovation
Green acquirer	−1.463***	−1.220***
	(−20.921)	(−17.608)
Control variables	Yes	Yes
Year, industry and country dummies	Yes	Yes
N	7788	7788
R^2	0.234	0.223

Panel B: Takeover premium

Dependent variable: Premium	(1) 1-day	(2) 1-week	(3) 4-week	(4) 1-day	(5) 1-week	(6) 4-week
Green acquirer	−0.034**	−0.057***	−0.037**	−0.058***	−0.081***	−0.060***
	(−2.104)	(−2.774)	(−2.179)	(−3.363)	(−3.230)	(−3.299)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	2808	2808	2808	2808	2808
R^2	0.096	0.085	0.102	0.098	0.087	0.104

Panel C: Target returns

	High product innovation			High process innovation		
Dependent variable:	(1) 3-day returns	(2) 5-day returns	(3) 51-day returns	(4) 3-day returns	(5) 5-day returns	(6) 51-day returns
Green acquirer	−0.018***	−0.009**	−0.008**	−0.026***	−0.016***	−0.013***
	(−2.774)	(−2.104)	(−2.179)	(−3.230)	(−3.363)	(−3.299)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	2808	2808	2808	2808	2808
R^2	0.085	0.096	0.102	0.087	0.098	0.104

Note: This table shows the association between green acquirers, acquisition efficiency and takeover premiums. Panel A shows the effect of green acquirers on acquisition efficiency – a log of days taken to complete the deal. Panel B reports the effect of green acquirers on takeover premium (ratio of the acquirer's offer price to the target's stock price 1 day, 1 week and 4 weeks before the deal announcement). Panel C shows the results for the impact of green acquirers on target returns. High product or process innovation (key variables of interest) is a dummy variable that equals one if the acquirer's level of innovation under assigned categories is above the sample median and zero otherwise. All control variables are the same as in Table 3 and defined in Appendix A. We winsorized continuous variables by 1% of their tail distributions. For heteroscedasticity, we use White's (1980) robust standard errors; *t*-statistics are in parentheses. All probit models include use year, industry and country dummies. *, ** and *** show the level of statistical significance at 10%, 5% and 1%, respectively.
*$p < 0.1$; **$p < 0.05$; ***$p<0.01$

information and sustainable resources in the target selection and takeover benefits.

Theoretically, our study articulates the association between green innovation and target selection, which emphasizes the role of information economics and RBV in the M&A literature. According to information economics, information asymmetry is a constraint in the target selection (Adra and Barbopoulos, 2019; Borochin, Ghosh and Huang, 2019; Capron and Shen, 2007). Acquirers and targets spend substantial resources to inscribe the complications emerging from information asymmetry in the takeover market: acquirers use several approaches to attenuate the information gap, such as screening through the equity market (Shen and Reuer, 2005), lengthy negotiations, and lower takeover premium (Coff, 1999), or contingent earnouts (Ragozzino and Reuer, 2007). Targets also have several ways to signal their quality to prospective acquirers, including initial public offerings (Reuer and Shen, 2004) or financial reporting quality (Skaife and Wangerin, 2013). RBV theorists contend that the strategic capabilities of an enterprise, such as green innovation, consummate the condition of being inimitable, non-substitutable, rare and valuable, allowing it to establish a competitive advantage (Cainelli, De Marchi and Grandinetti, 2015; Farza *et al.*, 2021). Acquirers with green innovation have competitiveness and bargain on better terms using available information about the target firm. This study combines the role of information asymmetry and green resources to understand the dynamics

Table 8. Robustness test

Panel A: Excluding dominant years (2011, 2012, 2016)	High product innovation		High process innovation	
Dependent variable	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry
Green acquirer	0.488***	0.235***	0.315***	0.218***
	(7.613)	(3.459)	(4.887)	(3.208)
Control variables	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes
N	5804	5783	5804	5783
Pseudo R^2	0.1017	0.1159	0.0972	0.1157

Panel B: Excluding dominant years (2011, 2012, 2016)	High product innovation		High process innovation		High product innovation		High process innovation	
Dependent variable CARs [−1, +1]	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.006***	0.006***	0.004**	0.005***	0.001	0.003	−0.001	−0.001
	(2.903)	(3.991)	(1.971)	(3.097)	(0.437)	(1.086)	(−0.518)	(−0.320)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2202	3896	2202	3896	3607	1913	3607	1913
R^2	0.092	0.044	0.090	0.042	0.061	0.091	0.061	0.091

Panel C: Excluding top countries (US, Germany, France)	High product innovation		High process innovation	
Dependent variables	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry
Green acquirer	0.646***	0.418***	0.587***	0.399***
	(5.191)	(3.197)	(4.186)	(2.700)
Control variables	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes
N	2031	2033	2031	2033
Pseudo R^2	0.1988	0.1385	0.1954	0.1374

Panel D: Excluding top countries (US, Germany, France)	High product innovation		High process innovation		High product innovation		High process innovation	
Dependent variable CARs [−1, +1]	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.007***	0.006***	0.005**	0.005***	0.001	0.003	−0.001	−0.000
	(3.478)	(4.377)	(2.529)	(3.474)	(0.666)	(1.275)	(−0.335)	(−0.053)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	5209	2808	5209	4980	2579	4980	2579
R^2	0.080	0.035	0.078	0.034	0.056	0.085	0.056	0.085

Panel E: Adding additional controls	High product innovation		High process innovation	
Dependent variables	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry
Green acquirer	0.404***	0.202***	0.270***	0.183***
	(6.609)	(3.173)	(4.321)	(2.821)
Firm value	−0.034***	0.007	−0.032***	0.008
	(−3.202)	(0.705)	(−3.000)	(0.726)
Liquidity	0.554***	−0.594***	0.519***	−0.608***
	(2.716)	(−2.929)	(2.548)	(−2.997)
Control variables	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes
N	7788	7788	7788	7788
Pseudo R^2	0.1333	0.1097	0.1308	0.1094

Table 8. (Continued)

Panel F: Adding additional controls

Dependent variable CARs [−1, +1]	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.007***	0.004***	0.005***	0.003*	0.001	0.004	−0.000	0.000
	(3.553)	(2.847)	(2.583)	(1.869)	(0.733)	(1.391)	(−0.261)	(0.114)
Firm value	−0.000	−0.000	−0.000	−0.000	−0.000	−0.001*	−0.000	−0.001
	(−1.530)	(−1.509)	(−1.422)	(−1.414)	(−1.044)	(−1.799)	(−0.930)	(−1.642)
Liquidity	0.000	−0.002	−0.001	−0.002	−0.001	−0.006	−0.001	−0.006
	(0.024)	(−0.285)	(−0.077)	(−0.326)	(−0.219)	(−0.622)	(−0.240)	(−0.663)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	5209	2808	5209	4980	2579	4980	2579
R^2	0.080	0.063	0.079	0.062	0.056	0.086	0.056	0.086

Panel G: Controlling exogenous shocks	High product innovation		High process innovation	
Dependent variables	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry
Green acquirer	0.431***	0.209***	0.289***	0.187***
	(7.199)	(3.306)	(4.734)	(2.902)
Covid-19	−0.390*	0.024	−0.433*	0.027
	(−1.726)	(0.104)	(−1.915)	(0.116)
Financial crisis 2007–2008	−0.325***	−0.042	−0.353***	−0.045
	(−3.454)	(−0.429)	(−3.752)	(−0.457)
Control variables	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes
N	7788	7788	7788	7788
Pseudo R^2	0.0978	0.1088	0.0949	0.1085

Panel H: Controlling exogenous shocks

Dependent variable CARs [−1, +1]	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Private target	(6) Non-related industry	(7) Private target	(8) Non-related industry
Green acquirer	0.007***	0.006***	0.005**	0.005***	0.001	0.003	−0.001	−0.000
	(3.478)	(4.377)	(2.529)	(3.474)	(0.666)	(1.275)	(−0.335)	(−0.053)
Covid-19	0.015*	0.024***	0.014	0.024***	0.015**	−0.006	0.014**	−0.007
	(1.711)	(4.151)	(1.614)	(4.082)	(2.216)	(−0.511)	(2.075)	(−0.675)
Financial crisis 2007–2008	0.002	0.006**	0.002	0.006**	0.007**	0.002	0.006**	0.000
	(0.729)	(2.266)	(0.593)	(2.209)	(2.325)	(0.397)	(2.148)	(0.111)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2808	5209	2808	5209	4980	2579	4980	2579
R^2	0.080	0.035	0.078	0.034	0.056	0.085	0.056	0.085

Panel I: Overall index

	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Private target	(6) Non-related industry
Overall green index	0.396***	0.215***	0.007***	0.004**	0.000	0.002
	(6.250)	(3.238)	(3.108)	(2.387)	(0.169)	(0.625)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	7788	7788	2808	5209	4980	2579
Pseudo R^2 or R^2	0.0965	0.1087	0.079	0.062	0.056	0.085

Table 8. (Continued)

Panel J: Subsamples	2005–2013				2014–2021			
Dependent variables	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Public target	(6) Related industry	(7) Public target	(8) Related industry
Green acquirer	0.447***	0.234***	0.272***	0.215***	0.424*	1.463***	0.582*	1.342**
	(6.282)	(3.150)	(3.771)	(2.867)	(1.683)	(2.845)	(1.655)	(2.419)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5064	5064	5064	5064	2724	2724	2724	2724
Pseudo R^2	0.125	0.126	0.121	0.126	0.091	0.118	0.091	0.117
Panel K: Subsamples	2005-2013				2014-2021			
Dependent variable CARs [−1, +1]	(1) Public target	(2) Related industry	(3) Public target	(4) Related industry	(5) Public target	(6) Related industry	(7) Public target	(8) Related industry
Green acquirer	0.008***	0.007***	0.006***	0.005***	0.005*	0.002*	0.001*	0.003
	(3.417)	(4.278)	(2.743)	(3.202)	(1.740)	(1.700)	(1.169)	(0.499)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, industry and country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1961	3317	847	1892	1961	3317	847	1892
R^2	0.082	0.034	0.154	0.060	0.079	0.031	0.154	0.060

Note: The table shows results from robustness tests of the association between green acquirers, target selections, and announcement returns. Our M&A sample covers 7788 deals announced between 2005 and 2021. We show results after dropping dominant years (Panels A and B) and countries (Panels C and D) during the sample period, the inclusion of firm value and liquidity as additional control variables (Panels E and F), controlling for exogenous shocks (Covid-19 and the Financial crisis 2007–2008) as reported in Panels G and H, using the overall index of green innovation developed based on all attributes of product and process innovation (Panel I), and for two sub-periods separately (Panels J and K). High product or process innovation (key variables of interest) is a dummy variable that equals one if the acquirer's level of innovation under assigned categories is above the sample median and zero otherwise. Our dependent variables include the public target, a dummy variable with a value of one if the target is a publicly listed firm and zero otherwise; the related industry target, a dummy variable with a value of one if the target is from the same industry as the acquirer; and acquirer returns calculated using the market model. We winsorized continuous variables by 1% of their tail distributions, and all variables are defined in Appendix A. *, ** and *** represent statistical significance levels at 10%, 5% and 1%, respectively. For heteroscedasticity, we use White's (1980) robust standard errors; *t*-statistics are in parentheses. All probit models include use year, industry, and country dummies.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

of target selection and takeover gains: green acquirers prefer higher information asymmetry vis à vis the target for minimizing decision errors and transaction costs.

Additionally, the findings from the fitted model underline the role of the decision-making of acquiring firm managers, which has been downplayed in the finance literature on target selections of publicly listed firms and firms from related industries. If gains to resource-rich firms are higher than those to resource-poor firms, acquirer choices should be elaborated. Our model enables us to identify the economic significance of green managers' choices and implies that they make informed takeover choices. On average, green acquirer managers' target selection is optimal under the obstacles they encounter, such as their preferences for gaining maximum information about the true value of the target firm and how they can use their green resources efficiently. Existing studies on alternative strategic choices, such as takeover experience or foreign entry mode (Cuypers, Cuypers and Martin, 2017; Shaver, 1998), draw similar conclusions. These studies argue that strategic choices are contingent on the post-acquisition target performance, and, thus, there are value implications regarding what choices lead to better performance.

Practical implications

Our work offers important implications for shareholders and managers. Shareholders can use deals of green acquirers as a signal of value creation, as such acquirers prioritize lower information asymmetries to avoid the risk of overpayment. Also, shareholders should stay informed about industry sustainability regulations that may influence a firm's attitude towards adopting green innovative standards and how they are associated with stock price reactions in M&As. Although scholars include firm-fixed effects in multivariate analysis, examining how specific firm characteristics, such as green innovation, affect shareholders' wealth is essential.

We focus on firm and industry information asymmetries that resource-rich firms can quickly mitigate. Thus, it is essential to understand that, for acquiring firm managers, the proper target selection, in general, and targets with lower information asymmetries, in partic-

ular, pave the way to takeover benefits. Masten (1993) identifies that if managers are ill-informed or mistaken, research on the determinants of takeover choices will communicate less regarding the actual impact on acquirer performance. Our results suggest that acquirers must consider the level of information asymmetry when selecting a target, and disregarding the role of lower information asymmetry in the target selection will destroy the acquirer's gains. Also, considering value appropriation (stemming from share liquidity and bargaining power), the takeover market of public firms is more competitive than that of private firms. In this situation, acquirers' innovative resources can give them a competitive advantage to have higher bargaining power and offer fair premiums to targets. Therefore, apart from the right target selection, acquiring firm managers must consider the value of innovative resources in the auction process. Finally, our robustness tests across subsamples and using additional control variables provide trustworthiness of findings for acquirer managers to consider the importance of exogenous shocks and the intensity of the takeover market when making M&A decisions for selecting the right targets and generating takeover value.

Limitations and future research

Despite making several significant contributions, this study is subject to some limitations that unlock avenues for future research in green M&As. First, our arguments related to the findings are based on efficient capital markets and are more pertinent to developed economics. Further research can be done on how green innovation affects target selection and returns by focusing on M&As in underdeveloped countries. Second, this research focuses on acquirer returns around the announcement date, which differs from long-term returns. Comparing the long-term returns of green acquirers' target selections will further enhance the generalizability of the study. Also, the non-availability of stock price data of private target firms does not allow us to examine the association between target selections and takeover synergies. Therefore, it would be captivating to investigate whether careful target selections are associated with long-term performance and takeover synergies. Third, we draw conclusions from M&As and cannot validate our results for other restructuring activities – joint ventures and strategic alliances – and other types of innovation. Future work can investigate the role of green innovation in other restructuring activities, which may improve our understanding of the importance of green resources in inorganic growth activities. It would also be interesting to examine whether other types of innovation prioritize information symmetries in the target selection. Lastly, we identified important dimensions of information asymmetries (i.e. firm and industry-related) and green resources. We have provided the foundation for future research to further build upon different dimensions for measuring the target's information asymmetries and green resources to enrich the understanding of their impacts on green M&As.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section at the end of the article.