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M&As, INNOVATION AND ESGS: MERGERS AND ACQUISITIONS IN THE SUSTAINABLE ERA

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Abstract

Mergers and acquisitions (M&As) are a piercing organizational event, a challenging and high-risk activity, but also a major strategic tool for firm resilience and growth. The complexity of this phenomenon has attracted tremendous academic attention over the years, from a broad range of management disciplines, encompassing the financial, strategic, behavioral, operational and cross-cultural aspects.

The need to consider people, planet, and profit (PPP), called by the current global scenario, has triggered multiple changes in companies' conducts. Business organizations increasingly take into account environmental and social implications in their strategic planning and investment decisions. Generally, this falls under the umbrella term of corporate social responsibility (CSR).

CSR and M&As represent two distinct research streams. Only very recently, these fields have started closing in. Nonetheless, their integration can provide mutual benefits for research advancement, as well as fostering business sustainable transformation.

Hence, this thesis aims to develop an integrative sustainability perspective on mergers and acquisitions, by combining three studies. The combination of these studies allows to shed light on value creation through acquisitions in the new sustainable era, by linking M&As, innovation and environmental, social and governance (ESG) factors. Overall, the combined results of the thesis outline a new focus on M&A research, putting forward its intertwining with CSR literature. Thus, the work contributes to the literature at the intersection of CSR and M&A research, while enriching each field. By emphasizing their integration through a lens of sustained value creation, the work is meant to encourage future academic developments and to offer insights for firms to increase the benefits from M&A activity.

Keywords: mergers and acquisitions, sustainability, ESG, corporate social responsibility, CSR

Declaration

This thesis has not been submitted in support of an application for another degree at this or any other university. It is the result of my work and includes nothing that is the outcome of work done in collaboration. Some of the ideas in this thesis, however, were the product of discussion with my supervisor, Professor Luca Maria Manzi, and my visiting supervisor, Professor Florian Bauer.

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Chapter 1 – Introduction

This thesis aims to develop an integrative perspective on mergers and acquisitions (M&A) operations in the context of corporate social responsibility (CSR), socially responsible investing, and sustainable development. In doing so, three distinct studies provide comprehensive insights into three aspects at the intersection of M&A and CSR research and practice. First, M&As as a valuable but also complex means to acquire external knowledge and technologies to advance corporate innovation, thus promoting sustained value creation. Second, M&A activity as a driver/inhibitor of a firm environmental, social and governance (ESG) performance. Third, M&As as a strategic option for firms to strengthen ESG reputation but also harmful signal when involving 'brown' targets. Thus, the thesis offers a holistic standpoint, shedding light on acquisitions as a form of strategic investment in the sustainable era, by linking M&A research with innovation and ESG perspectives. In the following sections, the rationale for this work is presented, arguing for a theoretical and practical interconnectedness. Thus, research gaps intended to be filled by the thesis are presented, together with main contributions.

1.1. Acquisition research: toward an integration of sustainability issues

Over the past century, M&As, traditionally referred to as acquisitions, have emerged as an eminent topic in strategic management research (Cartwright and Schoenberg, 2006; Nahavandi and Malekzadeh, 1994). Acquisitions are corporate activities that bring together two formerly independent firms, resulting in a new corporate structure (Hubbard, 1999; Coyle, 2000). They enable firms to alter their resources and capabilities to adapt to changing environments (Schoenberg, 2003; Barney, 1991; Teece, 2007). Through M&A processes, firms can expand product portfolios, gain access to new markets, increase managerial specialization and power, engage in cross-selling, broaden geographical distribution, pursue efficiency through the achievement of economies of scope and scale (Al-Sharkas, Hassan and Lawrence, 2008; Leon-Gonzalez and Tole, 2016). Furthermore, acquisitions can foster the transfer of valuable intangible assets between the target and the acquiring firms, such as know-how (Seth, Song and Pettit, 2000). Nonetheless, these processes involve high levels of complexity. Prior research persistently reports that acquisition failure rates range from 40% to 60% (Homburg and Bucerius, 2006; Schoenberg, 2006; Papadakis and Thanos, 2010; Almor, Tarba and Margalit, 2014). Despite the disappointing outcomes of acquisitions (Tuch and O'Sullivan, 2007), their popularity has resulted in an overall increase in M&A activity over the past decades (Financial Times, 2021). The dichotomy between the strategic importance of acquisitions and subsequent negative results has been labelled as the acquisition paradox (Cording, Christmann and Bourgeois, 2002). The challenge to tackle this paradox coherently led to multiple scientific debates. As a result, the theoretical body of acquisition literature diverged into a variety of lenses. For instance, Bauer and Matzler (2014) point out that four different schools of thought emerged: 1) the financial economics school, which analyses the impacts of M&As on firm performance and wealth based on stock market metrics, frequently adopting the event study methodology (Aktas, de Bodt and Cousin, 2007); 2) the strategic management school, studying the effect of pre-merger relatedness, similarity, or complementarity on firm performance; 3) the organizational behavior school, dealing with the effects of M&A deals on organizations, organizational culture, and individuals, or the impact of organization-related variables (e.g., acquisition experience) on firm performance; and 4) the process school (derived from the strategic management and the organization behavior school), picking up both premerger issues (e.g., cultural fit compatibility) and post-merger issues (e.g., degree of integration, or communication). Moreover, several influential reviews have been conducted over the years, broadening our understanding of acquisitions. Among them, Graebner et al. (2017) and Devers et al. (2020) review the post-merger integration literature, providing an overview of the various streams contributing to the acquisition integration literature. Haleblian et al. (2009) categorize M&A research in management, finance, accounting, economics and sociology, into a framework of antecedence, contextual settings, and outcome variables. Welch et al. (2020) reconnect the financial, accounting, and economic literature to focus more on the pre-deal phase by explicitly emphasizing deal initiation, target selection, bidding, negotiation, valuation, and announcement phase. King et al. (2004) offer a comprehensive review of variables affecting acquisition performance, ranging from payment methods to integration depth. Thus, prior findings on acquisitions contributed to advance extensively research on the topic over the past decades, enabling academics to decrease ambiguity on causations (Cording, Christmann and King, 2008; King et al., 2020a), reduce the complexity of the phenomenon (Weber and Tarba, 2010; Steigenberger, 2017), and explain heterogeneity of performance effects (Zollo and Meier, 2008; Meglio and Risberg, 2011; Das and Kapil, 2012). Nonetheless, a recurring issue highlighted by prior research (Zollo and Meier, 2008; Meglio and Risberg, 2011) regards the conceptualization of 'M&A performance', which still remains a matter to be settled by scholars (Meglio, 2020). Indeed, while acquisition performance is a multidimensional construct, researchers traditionally conceive value creation and destruction in acquisitions in terms of financial value, notably shareholder value, typically measured as the market reaction to deal announcement (Meglio and Risberg, 2011). However, acquisitions have the power to produce significant impacts not only at an individual and organizational-level, but at a societal level as well. For instance, takeovers of heavily polluting enterprises, supported by government subsidies, can promote green transformation (Liang et al., 2022). Furthermore, there is an increasing number of deals driven by sustainability or responsibility issues (Deloitte, 2021), whose value creation mechanisms cannot be captured by focusing exclusively on shareholder value. Additionally, acquisitions are complex events involving multiple stakes. Economic and social tensions emerge from task and human integration during the acquisition process, due to conflicting goals and temporal orientations (Meglio, King and Risberg, 2015; Bauer, Matzler and Wolf, 2016). By expanding research on acquisition process to consider a broader range of stakeholders, fruitful avenues of research can be opened up (Meglio, 2020). Thus, it is suggested that the topic of acquisitions offers various research opportunities by going beyond the traditional shareholder view (Meglio, 2020) and traditional performance indicators (González-Torres et al., 2020) to consider multistakeholder and sustainability-related issues.

1.2. Corporate social responsibility: an historical perspective

Academic and business communities largely recognize how the concept of corporate social responsibility has become a dominant paradigm in today business world, changing the strategic environment of business organizations and diverting the 'business as usual' model (Williams, 2014). Corporate social responsibility is defined, according to one of the most prominent conceptualisations proposed along the CSR literature, as "the social responsibility of business [which] encompasses the economic, legal, ethical, and discretionary [later referred to as philanthropic] expectations that society has of organizations at a given point in time" (Carroll, 1979, p. 500). The concept that business organizations have responsibilities towards society beyond that of making profits has definitely very distant origins (Latapí Agudelo, Jóhannsdóttir and Davídsdóttir, 2019), which some authors (Carroll and Shabana, 2010) ascribe more markedly to the early years of the Cold War (1945-1960), where the notion of CSR was leveraged by some academics and executives as a means of aligning business interests with the defense of free-market capitalism against the danger of Soviet Communism (Spector, 2008). In the 1950s and 1960s, the subject of CSR come up as a debate around the role of managers as trustees of the public interest, the balancing of competing claims to corporate resources, and corporate philanthropy, i.e., business support to good causes (Frederick, 2006). In these years, CSR research primarily adopts a macro-social level of analysis and theoretically embrace an ethical orientation (Latapí Agudelo, Jóhannsdóttir and Davídsdóttir, 2019). Indeed, in his book Social Responsibilities of the Businessman published in 1953, which can be regarded as the initiator of the modern era of social responsibility (Carroll and Shabana, 2010), Howard R. Bowen conceives CSR as part of a broader vision of better American society. Large American corporations have the power to exert a tangible impact on the well-being of citizens, but yet what responsibilities to society businessmen are reasonably expected to assume, is outlined as a white spot. CSR, however, is still a largely disputed and controversial issue at this time. Opponents to business involvement in social concerns, like T. Levitt and M. Friedman, advocate that general welfare falls under the responsibility of governments, while the business's part is to 'take care of the more material aspects of welfare' (Levitt, 1958, p.49); corporate managers' first and foremost

responsibility is the maximization of shareholder's wealth, and their commitment to CSR is viewed as the result of agency problems within the firm, a self-serving behavior that reduces shareholders' gains (Friedman, 1962). In the 1970s, due to social movements that took hold in the US during the 60s and new legislations enacted by the federal government following the energy crisis experienced in the 1970s, CSR surges in importance. Businesses responsibilities for social concerns become, to some extent, addressed and formalized, covering mainly environmental aspects, product safety, and labor rights (Carroll, 2015). The widespread understanding of CSR at that time is reflected in academic publications that mainly address companies' approaches to comply with the new responsibilities that have been set (Carroll, 2008), while some first attempts to reconciliate CSR and financial benefits, stemming from normative concerns, start to emerge (Lee, 2008). During the 1980s, a reduced regulatory framework leads scholars to focus on the operationalization of CSR as a response to groups such as shareholders, employees and consumers, and the term stakeholder becomes of common use (Carroll, 2008). CSR begins to be interpreted as a decision-making process (Jones, 1980) and the discussion revolves on the ways for implementing CSR (e.g., Cochran and Wood, 1984; Strand 1983; Tuzzolino and Armandi, 1981). A tighter coupling between corporate social performance (CSP), as the outcomes of socially responsive initiatives (Carroll and Shabana, 2010), and corporate financial performance (CFP) is observed (Lee, 2008), which will be stressed more in the 1990s. During this period, indeed, the globalization process takes new challenges and opportunities on multinational corporations, which are exposed to increased reputational risk due to higher global visibility, and conflicting pressures and demands from the home and the host countries, so that CSR becomes viewed as a strategic resource (Carroll, 2015). Some of the most notable contributions to the CSR debate of these years include: 1) Carroll (1991), who presents the "Pyramid of Corporate Social Responsibility" to provide executives with a useful approach to CSR that marks the primary role of economic responsibilities of a business (at the bottom of the pyramid), followed by the fulfilment of legal, ethical and, ultimately, philanthropic expectations; 2) Burke and Logsdon (1996), who identify the essential dimensions of a *strategic* approach to CSR, aimed at supporting the core business activities;

and 3) Elkington (1994), who elaborates the concept of "The Triple Bottom Line", as a sustainability framework that balances the company's social, environmental and economic impact. The key notion of these works, which will remain relevant in subsequent decades, is that corporations need to have socially and environmental responsible behavior that can be positively balanced with their economic goals. In the 2000s, a stronger global recognition and implementation of CSR is brought about by a number of actors. The United Nations launch, in July 2000, the UN Global Compact, as an initiative to promote the adoption of sustainable policies by companies around the world, informing the public about the results achieved, and setting the international agenda for the following 15 years through eight Millennium Development Goals (MDGs). The European Commission, adopt the first European Strategy on CSR in 2002. Finally, working groups of experts and international organizations, develop international certifications, such as the ISO 26000, to serve as guidelines for businesses to operate in a socially responsible way. Against this background, the discourse around the strategic management of CSR, tied to the notions of shared value creation (Porter and Kramer, 2006) and sustained value creation (Chandler and Werther, 2013; Chandler, 2016), flourishes among academics (e.g., Lantos, 2001; Werther and Chandler, 2005; Porter and Kramer, 2006; Berger, Cunningham and Drumwright, 2007; Husted and Allen, 2007). During the last decade, other milestones, such as the Paris Agreement on Climate Change in 2015, the launch of the 2030 Agenda for Sustainable Development, and the adoption of seventeen Sustainable Development Goals (SDGs), lead to the integration of the notion of sustainability, or sustainable development, into the CSR debate (Xia et al., 2018; ElAlfy et al., 2020; Lu et al., 2021).

1.3. The business case for sustainability: M&A as meaningful context of analysis

A dominant theme in CSR research is the so-called 'business case for sustainability', which refers to the underlying argument of why business organizations should engage in CSR policies, practices and activities (Carroll and Shabana, 2010). For instance, Kurucz, Colbert and Wheeler (2009) identify four

approaches to pursue CSR strategies: 1) reducing costs and risks; 2) gaining competitive advantage (differentiation strategy); 3) developing reputation and legitimacy; and 4) seeking win-win outcomes through synergistic value. In the attempt to establish the business case for CSR, a restless empirical quest to find the relation between CSP and CFP (see, for instance, van Beurden and Gössling, 2008; Wang, Dou and Jia, 2016, for literature reviews) has been predominant in the 'new world of CSR' (Vogel, 2005). The main aim was to answer the question: can companies 'do well by doing good'? (Falck and Heblich, 2007).

Over the years, a multitude of perspectives have been employed to account for the variety of ways in which CSR can improve the bottom line (Carroll and Shabana, 2010). A number of advantageous effects have been supported, notably benefits related to operating efficiency (Waddock and Graves, 1997; Saiia, Carroll and Buchholtz, 2003; Brammer and Millington, 2005), risk management (Cheng, Ioannou and Serafeim, 2014), earnings quality (Kim, Park and Wier, 2012), employment market (Valentine and Fleischman, 2007), product market (Bloom *et al.*, 2006; Singh, de los Salmones Sanchez and del Bosque, 2008), capital market (Richardson and Welker, 2001; Godfrey, Merrill and Hansen, 2009a), M&A-market (Aktas, de Bodt and Cousin, 2011; Deng, Kang and Low, 2013).

Research revealing a positive influence of CSR on the financial viability of firms, consequently flowed in the evolution of asset allocation process. Responsible investing, or ESG investing (van Duuren, Plantinga and Scholtens, 2016), defined as 'investment practices that integrate a consideration of ESG issues with the primary purpose of delivering higher-risk-adjusted financial returns' (Eccles and Viviers, 2011, p. 401), has become mainstream from a niche investment practice (Billio *et al.*, 2021; Gillan, Koch and Starks, 2021).

The term ESG is officially coined in 2004, with the publication of the report "Who Cares Wins" by the UN Global Compact Initiative (UN, 2004), grouping three of the main ethical finance pillars: environmental, social and governance. The environmental pillar refers to a company's ability to efficiently use natural resources in its operational processes, to turn to best management practices to avoid environmental risks, and to strive for a reduction of carbon footprint and pollution levels by seeking eco-friendly materials and procedures. The social dimension

measures a company's capacity to generate trust and loyalty among its stakeholders, to increase the quality of work conditions, to promote ethical values within the community and to ensure respect for human rights and safety. Finally, the governance factor represents the management's ability to take action in the interests of its shareholders through efficient corporate management systems, adherence to corporate behavior standards related to board diversification and gender pay gap, business ethics and transparency. Thus, ESG has been increasingly used as an evaluation tool by investors and the capital markets (Gillan, Koch and Starks, 2021), covering factors that are not traditionally considered in financial analyses, yet linked with financial evaluations and the long-term perspective of a company. Nonetheless, evaluating firms based on ESG criteria poses several challenges, some of which remain unsolved. In spite of the progresses made in the adoption and standardization of sustainability reporting, thanks to joint efforts by the Global Reporting Initiative (GRI), the International Integrated Reporting Initiative (IIRC), the Sustainability Accounting Standard Board (SASB), the European Commission, and the Task Force on Climate-Related Financial Disclosures (TCFD), the lack of standardization in terms of definitions and approaches to measuring ESG remains problematic (Billio et al., 2021).

Against this background, a number of credit rating agencies have caught the opportunity to expand into a new market segment, which has resulted in the proliferation of ESG ratings. Among them, the market appears to be dominated by data providers such as MSCI ESG Research, Sustainalytics Company ESG Reports, Bloomberg ESG Data Service, Thomson Reuters ESG Research Data, RepRisk, DowJones Sustainability Index (DJSI), Corporate Knights Global 100, and Institutional Shareholder Services (ISS). ESG scores allow investors and academics to easily make use of non-financial performance metrics. However, a discrepancy in methodologies, rating scales, and metrics has been highlighted (Gyönyörová, Stachoň and Stašek, 2021). Nonetheless, considering the ESG dimensions as part of a firm overall activity is a meaningful path of research in all fields (Huang, 2021). The close connection between ESG factors, as a spreading evaluation tool to drive socially responsible investments, and M&As, as one of the most important forms of investment decisions made by a firm to fulfil its strategic goals, brings out their

intertwining as an inspiring research domain. Further, M&A transactions provide an ideal context to investigate the business case for sustainability (Teti, Dell'Acqua and Bonsi, 2022), as M&A investment decisions can significantly impact shareholders' wealth (Deng, Kang and Low, 2013; Gomes and Marsat, 2018).

1.4. Rationale for the research and main contributions

The new "sustainability imperative" undoubtedly poses broad and complex challenges to business organizations (Lubin and Esty, 2010). In this context, mergers and acquisitions are strategic options to cope with the risks stemming from CSR/ESG engagement (from increased regulations, threats of taxes and fines, to changes in consumers and investors' expectations), but also to seize investment opportunities arising from it. Three aspects at the intersection of M&A and CSR/ESG research and practice are highlighted in the following paragraphs, which represent the *fil rouge* of this thesis.

First, innovation is underlined as the primary means by which companies can initiate their sustainable change path (Hall and Vredenburg, 2003; Padgett and Galan, 2010; Dicuonzo et al., 2022), addressing earnings management, corporate social responsibility, accountability and transparency, while promoting stakeholder engagement and sustainable reporting practices (Lombardi and Secundo, 2021). Sustainability innovation (SI), or sustainability-oriented innovation (Siqueira and Pitassi, 2016), has been specifically defined as "a process where sustainability considerations (environmental, social, and financial) are integrated into company systems from idea generation through to research and development (R&D) and commercialization. This applies to products, services and technologies, as well as to new business and organizational models" (Clark and Charter, 2007, p. 99). By adopting sustainability innovations, established firms can secure their legitimacy to operate (Schaltegger and Hörisch, 2017), gain competitive advantage (Hall and Vredenburg, 2003; Kennedy, Whiteman and van den Ende, 2017; Hermundsdottir and Aspelund, 2021), and, at the same time, contribute to the transformation of markets and industries toward sustainable development (Schaltegger and Wagner,

2011). However, achieving this goal is not a straightforward process, which calls for the need to combine a firm internal capabilities with external sources of learning (Cillo et al., 2019; Hübel, Weissbrod and Schaltegger, 2022). Acquisitions can be conceptualized as an advanced stage of an outside-in open innovation approach (Mawson and Brown, 2017, p. 17). Indeed, established firms increasingly rely upon knowledge from outside the firm's boundaries, by collaborating with and eventually acquiring start-ups (Brueller and Capron, 2021), which allows them to get access to technologies and disruptive ideas more rapidly (Pisoni and Onetti, 2018). Taking the cue from disappointing innovative outcomes of M&A operations found by early studies (Hitt and Hoskisson, 1991, 1996; Hoskisson, Hitt and Ireland, 1994), over time a rich amount of research has been conducted on M&As driven by innovative purposes (e.g., Ahuja and Katila, 2001; Puranam and Srikanth, 2007; Paruchuri and Eisenman, 2012). While research on collaborations with sustainable innovation ecosystems for SI is quite extensive (Cillo et al., 2019), and first evidences have emerged in the context of strategic alliances (Hübel, Weissbrod and Schaltegger, 2022), the link between M&As and SI is still unexplored. Even though sustainability innovation differs from conventional innovation (Hübel, Weissbrod and Schaltegger, 2022), the body of knowledge developed on innovation-motivated M&A, often referred to as technological acquisitions (Ahuja and Katila, 2001a), can provide valuable insights for future research addressing SI-driven M&A strategies. However, academic research on the topic remains largely fragmented, due to the multitude of ways in which acquisition motives are categorized (Aalbers, McCarthy and Heimeriks, 2021), the separate investigation of interconnected aspects of the phenomenon, and the variety of metrics used to assess post-M&A outcomes (Meglio, 2009; Zhou et al., 2018). Therefore, the first contribution of this paper-based thesis is to systematically review and critically analyze the extensive body of literature published up to date, on innovation-motivated acquisitions in the management field, by adopting the systematic literature review (SLR) methodology. The review work is based on a sample of 97 relevant academic articles, which are synthetized and organized in a comprehensive framework developed across decision-making, pre-merger phase, integration phase, and

outcomes. Theoretical and methodological insights for future research are then provided.

Paper 1: Technological Acquisitions: A Systematic Literature Review

Second, the dramatic increase in popularity of ESG investing has had a notable impact on M&A operations (Deloitte, 2021). ESGs increasingly represent parameters to scrutinize M&A deals, from target selection (Gomes, 2019; Krishnamurti *et al.*, 2019a; Boone and Uysal, 2020a), due diligence and valuation (Aktas, de Bodt and Cousin, 2011; Deng, Kang and Low, 2013; Gomes and Marsat, 2018; Maung, Wilson and Yu, 2020), deal completion (Arouri, Gomes and Pukthuanthong, 2019) to post-integration (Bereskin *et al.*, 2018). Further, ESG targets can represent a strategic objective of M&A transactions in itself: acquisitions become a mechanism for companies to achieve a significant uplift in ESG performance, by means of which middling ESG performers can transform into disruptors (Deloitte, 2021).

In line with the business case for sustainability, ESG-driven acquisitions could be carried out in order to learn and innovate, defend reputation, address legitimacy concerns, or capture sustainable and ethical value across deals to be integrated with corporate broader strategies. The first empirical evidences available support that M&A activity is a driver for firm ESG performance (e.g. Barros et al., 2022). However, takeovers are pervasive organizational phenomena (Meglio and Park, 2019) that can be disruptive for stakeholder-innovative practices (Waddock and Graves, 2006). The adoption of a stakeholder approach in the investigation of acquisition process and outcomes, which overcomes the traditional shareholdercentric view largely embraced by prior M&A research, is thus suggested to advance the current understanding on the complex and multi-faceted nature of this phenomenon (Meglio and Park, 2019). By taking into account a wider variety of stakeholders (over simply considering shareholders), the CSR and ESG concepts are well suited constructs to be integrated in M&A research. Nevertheless, the relationship between M&A and social responsibility or sustainability issues has received scant attention (Meglio, 2020). Particularly, very little literature on this

kind of research has been conducted to answer the question: 'what is the impact of mergers and acquisitions on sustainability performance?' (Tampakoudis and Anagnostopoulou, 2020a; Barros *et al.*, 2022).

Therefore, the second paper of this thesis purposes to test the impact of acquisitions on a firm ESG performance, by specifically addressing the importance of considering the motives underlying the operation (Aalbers, McCarthy and Heimeriks, 2021), and adopting a long-term perspective. To this aim, March (1991)'s exploration-exploitation framework is leveraged to categorize acquisition drivers, while ESG performance is measured using ESG scores provided by Thomson Reuters ASSET 4 database, in the three years subsequent deal completion. Data are gathered over a sample of M&A deals completed in the period 2010-2018 by bidders located in Europe, chosen as research setting for the strong commitment to business sustainable transformation by the European Union.

Paper 2: The Impact of Explorative Versus Exploitative Acquisitions on ESG Performance: An Evidence from European Acquirers

Third, by embracing a strategic approach to CSR engagement, i.e., the strategic use of CSR to derive private benefits (Siegel and Vitaliano, 2007), which constitutes the central argument of the business case for sustainability (Kurucz, Colbert and Wheeler, 2009), scholars, over time, have adopted a variety of theoretical lenses to understand strategic CSR. *Stakeholder management* theorists suggest that contracting on the basis of trust and cooperation ensures high benefits to the firm (Jones, 1995), thus empirical work have linked CSR initiatives, firm strategy, and firm performance (Berman *et al.*, 1999). Business ethics scholars tied to the *resource-based view* (RBV) emphasize the relationship between CSR activities, the development of a competitive advantage (Hart, 1995) and firm performance (Russo and Fouts, 1997). They propose that a commitment to CSR allows for building and maintain strategic assets, such as reputation, which lead to superior performance (Mcwilliams and Siegel, 2001; Branco and Rodrigues, 2006; Surroca, Tribó and Waddock, 2010). Then, *signaling theory* has been highlighted as a valuable perspective of investigation, as it complements other theories in economics, by associating CSR initiatives to the scenario of market failure (Zerbini, 2017), and pointing out the cueing process that links CSR initiatives to market responses. In this vein, firms strategically leverage CSR initiatives as market signals (Adams, Tashchian and Shore, 2001a; Bansal and Hunter, 2003; Robinson, Kleffner and Bertels, 2011; Simaens and Koster, 2013a).

In parallel, mergers and acquisitions represent a signal of an acquirer's resources, capabilities and aspirations (Chalençon et al., 2017), by means of which different cues are intentionally or unintentionally conveyed to the market (Gaur, Malhotra and Zhu, 2013; Ranju and Mallikarjunappa, 2019; Filip et al., 2022). M&A research has leveraged signaling theory in order to investigate, for instance, the relationship between deal characteristics and stock market reactions (Travlos, 1987; Tao et al., 2017), target assessment and selection (Wu and Reuer, 2021a), stock market reaction of acquiring firms' rivals (Gaur, Malhotra and Zhu, 2013; Ranju and Mallikarjunappa, 2019). Recent studies have highlighted that, from a signaling theory perspective, ESG activities help reducing information asymmetry between the acquiring firm and investors (Zhang, Zhang and Yang, 2022), and between bidders and targets (Ozdemir, Binesh and Erkmen, 2021; Hussaini, Rigoni and Perego, 2022). Furthermore, the acquisition of a socially responsible firm has been posited to be a signal, sent by the acquirer to the market, about the willingness to increase ESG performance (Aktas, de Bodt and Cousin, 2011). But what about the signal sent by the acquisition of a low-scoring firm? How do acquiring firms manage such acquisitions? Accordingly, in the third study of this thesis, the case of high-rated ESG firms acquiring low-rated ESG targets is examined. Drawing on signaling theory, a model of acquisition strategies implemented by 'green' companies targeting 'brown' firms, is developed and empirically tested over a sample of 368 M&A deals completed along the period 2010-2021. Subsequently, the impact of such strategic approaches on the acquirer's ESG performance postacquisition is analyzed by performing mediation analysis.

Paper 3: How Do Green Firms Hide Brown Acquisitions? A Signaling Theory Perspective

Hence, the main research gaps identified along the literature, and the subsequent contributions of this paper-based thesis, are below summarized (Fig. 1).

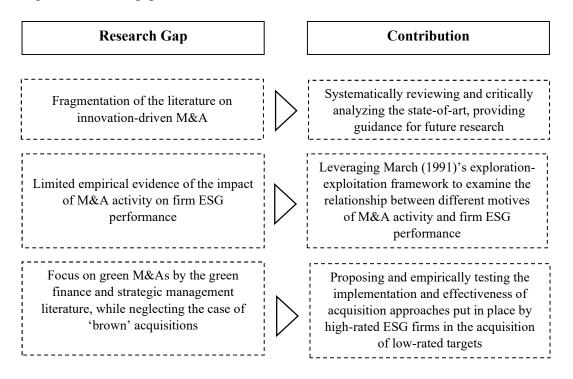


Fig. 1 - Research gaps and contributions

The rest of the thesis is organized as follows. The next three chapters present the aforementioned studies. Subsequently, the final chapter is dedicated to the conclusions, where contributions, theoretical and practical implications, as well as limitations and suggestion for future research are discussed.

Chapter 2 – Technological Acquisitions: A Systematic Literature review

2.1. Introduction

Over time, different merger and acquisitions (M&A) waves have been documented. The 1990s have marked the beginning of the fifth wave of M&A activity (Martynova and Renneboog, 2008). It is largely acknowledged that not all M&As are alike (Bowen, 2001). M&As can be driven by a variety of managerial motives (Angwin, 2007), e.g., extending into new markets or products, joining forces with or eliminating competitors, achieving economies of scale and scope. All waves exhibit unique patterns and underlying motives (Martynova and Renneboog, 2008). Since the 1990s, alongside traditional motives for M&A identified in the classical industrial organization literature, the rapid obtaining of novel technologies and capabilities has increasingly become a highly significant source of M&A activity (Ahuja and Katila, 2001b). It is enough to consider that in 2021 tech deals outright reached a volume of \$1.2 trillion, representing almost 30% of the total volume of completed transactions (The Stack, 2021). Companies operating within hightechnology industries, such as software, telecommunications, networking, electronics, information services, and biotechnology, show the greatest involvement in technology acquisitions (Ransbotham and Mitra, 2010), due to the higher environmental turbulence and higher rate of knowledge depreciation to be faced (Cloodt, Hagedoorn and Van Kranenburg, 2006a). Microsoft and Cisco represent star cases of the successful outcomes that can be derived from the combination of internal research and development (R&D) efforts with aggressive acquisition programs to cope with technological advancements in the high-tech sector. The pressures set by the digital revolution and the UN sustainable development goals (SDGs), however, brought a global scenario, rich in new challenges, which also non-technological incumbents are called to tackle. Against this background, established firms are increasingly harnessing knowledge coming from outside the company's boundaries, by collaborating with and eventually acquiring venture capital-backed enterprises (Pisoni and Onetti, 2018; Brueller and

Capron, 2021). Pursuing an outside-in open innovation strategy (Mawson and Brown, 2017b) allows these companies to access technologies more rapidly and bet on disruptive business model ideas, while offering a viable exit strategy to startups (Pisoni and Onetti, 2018).

Despite these premises, a long tradition of management-based acquisitions literature investigating the link between M&As and innovation suggests disappointing post-acquisition innovation outcomes (Hitt and Hoskisson, 1991) due to post-merger integration and assimilation-based related issues (Ahuja and Katila, 2001; Cloodt, Hagedoorn and Van Kranenburg, 2006). Most of these studies, however, have largely neglected to consider the different motives underlying M&A (Ahuja and Katila, 2001b). Thus, over time scholars have started to address the specific case of 'technological acquisitions' (TA) or, as sometimes referred to, 'technology acquisitions', 'technology-driven acquisitions' or 'innovation-driven acquisitions', which have been defined as acquisitions undertaken for technological reasons with the sole intent to learn (Cloodt, Hagedoorn and Van Kranenburg, 2006a). The potentially valuable but also challenging nature of these acquisitions has spurred an ever-growing body of studies. However, academic research on the topic remains largely fragmented, due to the multitude of ways in which acquisition motives are categorized (Aalbers, McCarthy and Heimeriks, 2021), the separate investigation of interconnected aspects of the phenomenon, and the variety of metrics used to assess post-M&A outcomes (Meglio, 2009; Zhou et al., 2018).

With this in mind, this study aims to systematically review and critically analyze the rich, but dispersed, current level of research conducted on TA in the business and management area. More precisely, the intended objectives are the following: 1) to analyze articles in terms of context of analysis, variables adopted, theories and methodologies, in order to map extant research; 2) to identify main themes and findings across the literature to provide a synthesis and analysis of the state-of-art on the topic; 3) to synthetize findings into a comprehensive and up to date framework that can synthetically but effectively represent key dimensions of the phenomenon under consideration; 4) to identify knowledge gaps that can represent a fruitful starting point for future avenues of research in the domain. This work contributes in many ways to scholarly research and management practice. First, the study adds to existing M&A and innovation research by providing a systematic literature review on innovation-driven acquisitions. By acknowledging some prior efforts undertaken to systematize the current level of knowledge on the topic (Dezi et al., 2018; Christofi et al., 2019), this work brings a novel contribution for what concerns the types of reviews conducted and the level of analysis. Indeed, it differs from the reviews by Dezi et al. (2018), who did not provide a theme-based synthesis and integrative framework, and by Christofi et al. (2019), as it proposes to explore TA at a company-level, thus not specifically adopting a micro-foundational perspective. Second, the study provides a comprehensive framework, developed across pre-merger and post-merger stages, that unifies and organizes existing studies. Third, this reviewing work allows to identify emerging themes, main findings, limitations of extant research and research gaps, which can be leveraged to further advance academic research on the topic. Finally, the study builds a holistic understanding on antecedents, integration mechanisms and outcomes of technological M&A, which can serve as a guiding tool for executives in developing effective acquisition strategies resulting in successful financial and innovative outcomes.

The paper is organized as follows. In the next section, I provide the rationale for undertaking a systematic review methodology and I describe the data collection process. In the subsequent section, I offer a descriptive and thematic analysis of the findings. Following, in the synthesis section I categorize and analyze the findings and present a comprehensive conceptual framework. Then, research gaps and avenues for future research are presented. Lastly, the contributions of this review are provided.

2.2. Methodology

Literature reviews provide academics and practitioners with an organic organization of the existing amount of knowledge on a well-defined topic and give useful insights addressed to further research development. Particularly, literature reviews can unify a fragmented existing literature on a certain subject, further expanding an emerging research area, either complementing an existing body of contributions, or consolidating from a conceptual point of view a specific research field. Specifically, this paper aims to analyze and present in a comprehensive manner contributions on the topic of TA for further progress in theory and practice. Systematic review refers to a specific methodology consisting in a thorough review process of the extant research on a clearly specified question, conducted by applying explicit and systematic procedures in order to identify, choose and critically evaluate relevant research, and to extrapolate and analyze findings and data from the selected studies for review (Christofi, Leonidou and Vrontis, 2017). Hence, the distinctive feature that differentiates systematic review from traditional narrative review is that the former is based on a process of contribution collecting, evaluating, and analyzing carried out on systematic criteria. The methodology originates from medical sciences field (e.g., systematic reviews of randomized controlled trials used to develop evidence-based medicine), but over the years it has also been increasingly embraced by business and management researchers. Its peculiarity lies in the application of transparent protocols and a replicable process (Tranfield, Denyer and Smart, 2003), enhancing the rigor, validity and generalizability of findings, thus providing both academics and practitioners with a reliable knowledge base (Vrontis and Christofi, 2021).

Based on this, I decide to apply a systematic review methodology instead of a traditional review in order to provide a replicable, rigorous, and transparent assessment of the extant literature on the topic cumulated to date. I follow Denyer and Tranfield's (2009) five-steps model to produce a systematic review: 1) question formulation, 2) existing studies localization, 3) contribution selection and evaluation, 4) data analysis and synthesis, and 5) results reporting in such a way to allow reaching reasonably clear conclusions. The methodology process performed is described more in depth in the next paragraphs.

Question formulation. During the first stage, I formulate the review question from which search strings for the scientific database search are defined. As the objective of this paper is intentionally broad, a common feature for such review work types (Xiao and Nicholson, 2013), the following research question has been set: *What is*

the contribution provided by the academic community in the business and management field to the understanding of technological acquisitions to date?

Localization of studies. Guided by the above research question and after running a pilot study to identify the most suitable keywords, I model the structure of the search strings on the broadest basis possible. Then, I search for the presence of the selected keywords in the title, abstracts, and keywords of the articles, as these fields usually contain the search terms (Vrontis and Christofi, 2021). Thus, I derive the following search strategy for data collection: TITLE-ABS-KEY ((technolog* OR innovat* OR *tech OR "knowledge-intensive") AND ("M&A" OR "M&As" OR "mergers and acquisitions")), OR ("technological acquisition*" OR "startup* acquisition*" OR "start-up* acquisition*"). Wildcards are used to comprise all words with a same root but a different ending, for example, technolog* is used to capture words like technology, technologies, or technological. Moreover, the keywords in each group are associated with the Boolean OR operator to create a search string for the respective group, while the group search strings are linked with the Boolean AND operator to develop combined search strings. By searching for studies that contain the words technolog* OR innovat* combined with "M&A" OR "M&As" OR "mergers and acquisitions", I ensure the inclusion of works related to "technological innovation" and "M&As", "innovation-driven M&As", "M&As to acquire technologies". Further, the keywords *tech OR "knowledge-intensive" allow to consider M&A operations where the acquiring firm and/or the target are technology-intensive firms or operating in knowledge-driven industries. Indeed, studies may not refer explicitly to technological M&A in the title or abstract, but leverage such industries as context of analysis. In these industries, M&A operations are likely to be primarily motivated by technology/knowledge acquisition. I chose not to include in the above string the word "acquisition*" to exclude studies dealing in broader terms with open innovation practices for knowledge acquisition and not specifically with external sourcing of technologies by means of M&A transactions. For this reason, the search strategy does not include the expression "technology acquisition*". However, studies that focus on technology acquisition in reference to the use and integration of technologies by means of M&As are rationally expected to show M&A-related keywords in the abstract, thus falling under the search strategy adopted. Nonetheless, the search string "technological acquisition*" OR "startup* acquisition*" OR "start-up* acquisition* enables to detect articles related to technology-driven M&As, as they are mainly referred to as "technological acquisitions", and to include works dealing with the acquisition of start-ups, which are the epitome of innovation.

Following previous studies, I use Web of Science database as my search engine (e.g., Cillo *et al.*, 2019), as one of the most influential database of scientific production, and a highly overlapping data source compared to Scopus database (Gavel and Iselid, 2008; Waltman, 2016). The initial search returns 3196 results, which are narrowed down according to exclusion criteria and quality assessment described in the following paragraph.

Selection and evaluation. Subsequently, I restrict the initial sample of possible relevant studies according to various exclusion criteria. First, based on the research question driving the review work, the research has been restricted to management studies, thus excluding the other research fields. Second, in line with previous systematic literature reviews (Christofi et al., 2019; Vrontis and Christofi, 2021), I limit the type of contributions to publications in peer-reviewed academic journals (issued or in-press) that have full text, to ensure the inclusion of documents that meet objective evaluation criteria. Thus, I exclude non-academic articles, such as book chapters, editorials, conference papers, extended abstracts, and book reviews. Conference papers are not included into the research, as tight length constraints limiting authors' contributions are usually set. Third, I exclude articles with no English version available. No time restrictions are set, as the intended objective is to systematically reviewing relevant contributions provided up to date. Despite the present review is conducted in the course of 2022, contributions published in 2022 have been included to provide an up to date, even though not comprehensive, portray of the current state-of-art.

The list of contributions fitting the above criteria is downloaded on February 5th, 2022. In a preliminary data cleaning, few duplicated articles are eliminated, leading to a sample of 338 articles. Subsequently, I further limit the review to studies in peer-reviewed journals ranked in the Chartered Association of Business Schools

(ABS) 2021 Academic Journals Guide (AJG) as a well-acknowledged list of relevant academic journals published within the Business and Management field. This filtering process yields a sample of 301 articles to be manually screened. An initial title and abstract-based analysis are conducted to filter those papers fitting the research aim of this study. At this stage, the aim of the review is to be highly inclusive, without putting too much attention on whether the study falls completely or partially within the intended scope of the review, and comprising instead all possibly relevant studies. This process enables the identification of 119 papers to be further analyzed.

Then, I define the conceptual boundaries guiding the following round of review (inclusion criteria), based on a full text reading. First, the investigation of innovation-motivated M&A have to be either outlined as the main objective of the study in the research introduction, or the intention to focus on technology/innovation motives is explicitly stated by the authors in setting the criteria for sample selection. As a consequence, articles dealing with the link between M&A and innovation, and studies addressing the acquisition of knowledge-intensive firms, are included only if the above conditions are met. This allows the review work to be focused solely on contributions intended to improve the academic understanding of technology motived M&As. Second, articles dealing with the acquisition of start-ups are considered only if they do not focus exclusively on M&As as an exit strategy from the acquired firm perspective.

After this second round of review, 87 articles remain in the sample. Following Vrontis and Christofi (2021), I then employ a backward and forward snowballing process by manually searching the references of all selected articles. Additional studies retrieved are also screened according to the exclusion, inclusion, and quality criteria using a title, abstract and full text analysis. This step expands the pool to comprise 10 more articles, thus ultimately leading to a sample of 97 articles. Fig. illustrates the overall review process.

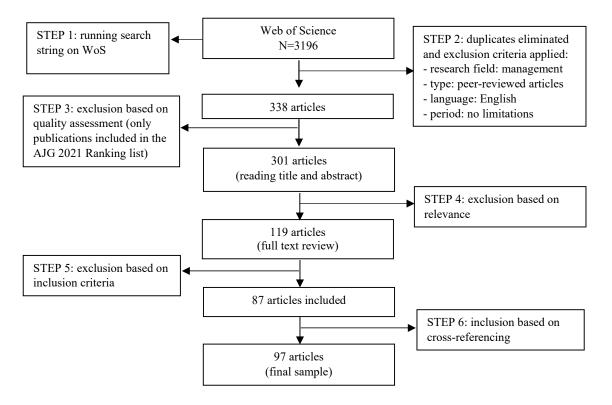


Fig. 2 - Step of search process and number of selected studies in each step

Data analysis/synthesis and reporting. Relevant data from all 97 articles are then extracted to a data extraction form (Tranfield, Denyer and Smart, 2003) designed to capture the publication details (authors, title, year, journal, number of citations), summarize key findings, and describe methodological features. Specifically, I manually collect information concerning the criteria used to identify innovation-driven M&As, sample industry and geographical location, type of methodology applied (quantitative or qualitative), type of data used (primary and/or secondary), theoretical background. Results of data collection are reported in Table 1.

Authors	Article Title	Journal	Year	Motive categorization	Sample industry	Sample location	Methodology	Data type	Theoretical background
Lee, J; Lee, J	Enablers of postacquisition joint knowledge creation: evidence from joint patenting in high-tech mergers and acquisitions	JOURNAL OF KNOWLEDGE MANAGEMENT	2022	industry	biotechnology, chemical, computer equipment, software, communications, electronic and electrical equipment	US	quantitative	secondary	prior research on knowledge management
Testoni, M	The market value spillovers of technological acquisitions: Evidence from patent-text analysis	STRATEGIC MANAGEMENT JOURNAL	2022	targets applied for at least one patent during the 5 years preceding the announcement year	all industries	US	quantitative	secondary	RBV
Ng, W; Stuart, TE	Acquired employees versus hired employees: Retained or turned over?	STRATEGIC MANAGEMENT JOURNAL	2022	Target type (VC-backed companies)	all industries	all countries	quantitative	secondary	prior research on hiring modes
Wu, J; Yu, LM; Khan, Z	How Do Mutual Dependence and Power Imbalance Condition the Effects of Technological Similarity on Post-acquisition Innovation Performance Over Time?	BRITISH JOURNAL OF MANAGEMENT	2021	not specified	all industries	US	quantitative	secondary	resource dependence theory
Brueller, NN; Capron, L	Acquisitions of Startups by Incumbents: The 3 Cs of Co- Specialization from Startup Inception to Post-Merger Integration	CALIFORNIA MANAGEMENT REVIEW	2021	target type (start-up)	information and communications technology (ICT)	Isreal (target firms)	qualitative (multiple case studies)	primary	prior research on M&A
Hanif, N; Wu, JF; Babar, AB	Linking ownership acquired in Chinese firms to post- acquisition innovation performance: role of institutional distance	CHINESE MANAGEMENT STUDIES	2021	industry and announced motive	computer industry, electronics, communications and biotechnology	China (target firms)	quantitative	secondary	agency theory, institutional theory
Hanelt, A; Firk, S; Hilebrandt, B; Kolbe, LM	Digital M&A, digital innovation, and firm performance: an empirical investigation	EUROPEAN JOURNAL OF INFORMATION SYSTEMS	2021	industry	automotive	all countries			KBV, digital innovation
Sedita, SR; Belussi, F; De Noni, I; Apa, R	The technological acquisitions paradox in the beauty industry	EUROPEAN JOURNAL OF INNOVATION MANAGEMENT	2021	website, press release, journal articles	beauty	America	qualitative (case study)	primary and secondary	prior resarch on TA and knowledge recombination
Issah, AB	Post M&A innovation in family firms	EUROPEAN JOURNAL OF	2021	industry	manufacturing	US	quantitative	secondary	RBV

Table 1 - Papers from systematic literature review

		INNOVATION MANAGEMENT							
Chen, W; Jin, FJ; Xue, L	Flourish or Perish? The Impact of Technological Acquisitions on Contributions to Open- Source Software	INFORMATION SYSTEMS RESEARCH	2021	entities listed in GitHub (open-source software activity)	all industries	all countries	quantitative	secondary	signalling theory, resource combination potential
Nakagawa, K; Nakaya, M	COMPETITIVE POSITIONING AS ANTECEDENTS OF EXPLORATIVE AND EXPLOITATIVE TECHNOLOGICAL ACQUISITIONS: EVIDENCE FROM SEMICONDUCTOR INDUSTRY	INTERNATIONAL JOURNAL OF INNOVATION MANAGEMENT	2021	industry and declared motives to distinguish explorative and exploitative TA	semiconductor	mainly US	quantitative	secondary	competitive positioning theory
Wu, CW; Reuer, JJ	Acquirers' Reception of Signals in M&A Markets: Effects of Acquirer Experiences on Target Selection	JOURNAL OF MANAGEMENT STUDIES	2021	target industry and type (VC-backed ventures)	biotechnology	US	quantitative	secondary	signalling theory
Arroyabe, MF	The role of patent expiration in acquisition decision and target selection in the pharmaceutical industry	R & D MANAGEMENT	2021	industry	pharmaceutical	US	quantitative	secondary	RBV
Rios, LA	On the origin of technological acquisition strategy: The interaction between organizational plasticity and environmental munificence	STRATEGIC MANAGEMENT JOURNAL	2021	target innovative activity (at least one patent)	all industries	US	quantitative	secondary	evolutionary economics and organizational theory
Chondrakis, G; Serrano, CJ; Ziedonis, RH	Information disclosure and the market for acquiring technology companies	STRATEGIC MANAGEMENT JOURNAL	2021	acquirer and target innovative activity (potential acquirers with at least 5 patents granted during the pre-AIPA period, target firms at least one patent granted prior the acquisition announcement)	sectors with an average R&D intensity of 5% and with at least 50 patents granted to all industry participants during the pre-AIPA period	US	quantitative	secondary	research on markets for technology and strategic factor market theory
Chen, FQ; Ge, YH; Liu, HQ	Overseas M&A integration and industrial innovation: a study based on internal and external knowledge network reconfiguration	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2021	target innovative activity (target has granted any patents within 3 years prior to the transaction)	manufacturing high-tech	China	quantitative	secondary	RBV, network theory

Si, YF; Liu, WX; Zhang, Y	Which forms of R&D internationalisation behaviours promote firm's innovation performance? An empirical study from the China International Industry Fair 2016-2018	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2021	not specified	manufacturing	China	quantitative	primary and secondary	prior research on R&D internationalisation and innovation performance
Calza, F; Parmentola, A; Tutore, I	For green or not for green? The effect of cooperation goals and type on environmental performance	BUSINESS STRATEGY AND THE ENVIRONMENT	2021	announced motive (knowledge for environmental goals)	all industries	all countries	quantitative	secondary	prior research on inter- organizational collaborations
Roh, T; Hwang, J; Park, BI	M&A successes: Breadth, depth, and deal completion time in the US semiconductor industry	BRQ-BUSINESS RESEARCH QUARTERLY	2021	industry	semiconductor	US	quantitative	secondary	organizational learning
Marra, A; Carlei, V; Baldassari, C	Exploring networks of proximity for partner selection, firms' collaboration and knowledge exchange. The case of clean-tech industry	BUSINESS STRATEGY AND THE ENVIRONMENT	2020	target industry and type (green start-ups)	software, clean-tech, nano-tech, consumer electronics, natural resources, marketing, financial services and mobile app sectors	all countries	quantitative	secondary	prior literature on methodologies for partner screening and selection
Cefis, E; Marsili, O; Rigamonti, D	In and Out of Balance: Industry Relatedness, Learning Capabilities and Post- Acquisition Innovative Performance	JOURNAL OF MANAGEMENT STUDIES	2020	not specified	all industries	Netherlands	quantitative	secondary	organizational learning
Chen, IJ; Hsu, PH; Officer, MS; Wang, YZ	The Oscar goes to: High-tech firms' acquisitions in response to rivals' technology breakthroughs	RESEARCH POLICY	2020	subsample of R&D- intensive industries	all industries	US	quantitative	secondary	prior research on M&A
Yu, HY; Dang, JW; Motohashi, K	Post-M&A technological capability-building of emerging market firms in China: the case of Lenovo	ASIA PACIFIC BUSINESS REVIEW	2019	announced motive	computer technology	China	quantitative (one acquisition)	secondary	prior research on M&A
Tarba, SY; Ahammad, MF; Junni, P; Stokes, P; Morag, O	The Impact of Organizational Culture Differences, Synergy Potential, and Autonomy Granted to the Acquired High- Tech Firms on the M&A Performance	GROUP & ORGANIZATION MANAGEMENT	2019	industry	high-tech	Israel	quantitative	primary	prior research on M&A
Muratova, Y; Rigamonti, D; Wulff, JN	The effect of acquisitions on exploration and exploitation in China	JOURNAL OF STRATEGY AND MANAGEMENT	2019	industry	semiconductor	China	quantitative	secondary	organizational learning

Fernandez, S; Triguero, A; Alfaro- Cortes, E	M&A effects on innovation and profitability in large European firms	MANAGEMENT DECISION	2019	inclusion in the European Industrial R&D Investment Scoreboard	electronic and electrical equipment	Europe	quantitative	secondary	prior research on M&A and innovation
Zhao, X; Lin, DL; Hao, T	A new discussion on the relationship between M&A and innovation in an emerging market: the moderating effect of post-acquisition R&D investment	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2019	industry and announced motive	aerospace, pharmaceutical, electronic and communication equipment, computer equipment, and medical equipment and instruments	China	quantitative	secondary	prior search on M&A and innovation
Kwon, O; Lim, S; Lee, DH	Acquiring startups in the energy sector: a study of firm value and environmental policy	BUSINESS STRATEGY AND THE ENVIRONMENT	2018	target type (start-up)	energy (targets)	US	quantitative	secondary	prior research on startup acquisitions
Zhou, X; Mitkova, L; Zhang, Y; Huang, L; Cunningham, S; Shang, LN; Yu, HZ; Wang, KR	Technology-driven mergers and acquisitions of Chinese acquirers: development of a multi-dimensional framework for post-innovation performance	INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	2018	industry and announced motives	computer numerical control machine tool, healthcare equipment, information communication and technology	China	qualitative (multiple case studies)	secondary	prior research on TA
Han, J; Jo, GS; Kang, J	Is high-quality knowledge always beneficial? Knowledge overlap and innovation performance in technological mergers and acquisitions	JOURNAL OF MANAGEMENT & ORGANIZATION	2018	industry and target activity (at least one patent in the 5 years prior to the M&A)	high-tech	all countries	quantitative	secondary	organizational learning, prior research on M&A and innovation
Sears, JB	Post-acquisition integrative versus independent innovation: A story of dueling success factors	RESEARCH POLICY	2018	announced motive	manufacturing	all countrries	quantitative	secondary	absorptive capacity
Mawson, S; Brown, R	Entrepreneurial acquisitions, open innovation and UK high growth SMEs	INDUSTRY AND INNOVATION	2017	industry	life science, computer software, IT services	Scotland	qualitative (multiple case studies)	primary	prior research on M&A and open innovation
Shin, SR; Han, J; Marhold, K; Kang, J	Reconfiguring the firm's core technological portfolio through open innovation: focusing on technological M&A	JOURNAL OF KNOWLEDGE MANAGEMENT	2017	industry	biopharmaceutical	all countries	quantitative	secondary	prior research on M&A and technology management
Oberg, C; Leminen, S	Gap analysis for innovative firm acquisition - acquirer and acquired party perspectives	JOURNAL OF ORGANIZATIONAL CHANGE MANAGEMENT	2017	primary data	high-tech	-	qualitative (multiple case studies)	primary	prior reserach on M&A
Harrigan, KR; Di Guardo, MC; Cowgill, B	Multiplicative-innovation synergies: tests in technological acquisitions	JOURNAL OF TECHNOLOGY TRANSFER	2017	industry	electronics	US	quantitative	secondary	innovation synergies

Caviggioli, F; De Marco, A; Scellato, G; Ughetto, E	Corporate strategies for technology acquisition: evidence from patent transactions	MANAGEMENT DECISION	2017	change of ownership in patents	motor vehicle parts and accessories, semiconductors, computer communication equipment	US and Europe	quantitative	secondary	prior research on strategic alliances and M&A
Ozmel, U; Reuer, JJ; Wu, CW	Interorganizational Imitation and Acquisitions of High-tech Ventures	STRATEGIC MANAGEMENT JOURNAL	2017	target industry and type (VC-backed ventures)	biotechnology	all countries	quantitative	secondary	frequency- and trait-based imitation
Chen, FQ; Li, F; Meng, QS	Integration and autonomy in Chinese technology-sourcing cross-border M&As: from the perspective of resource similarity and resource complementarity	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2017	industry and announced motive	high-tech and manufacturing	China	quantitative	secondary	prior search on M&A and innovation
Ma, CL; Liu, ZY	Effects of M&As on innovation performance: empirical evidence from Chinese listed manufacturing enterprises	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2017	announced motives (technology acquisition) and acquirer patent activity (any patenting activity in the five years before the M&A)	manufacturing	China	quantitative	secondary	prior search on M&A and innovation
Ganzaroli, A; De Noni, I; Orsi, L; Belussi, F	The combined effect of technological relatedness and knowledge utilization on explorative and exploitative invention performance post- M&A	EUROPEAN JOURNAL OF INNOVATION MANAGEMENT	2016	industry	bio-pharmaceutical	North America and Europe	quantitative	secondary	absorptive capacity, prior research on TA
Dunlap, D; McDonough, EF; Mudambi, R; Swift, T	Making Up Is Hard to Do: Knowledge Acquisition Strategies and the Nature of New Product Innovation	JOURNAL OF PRODUCT INNOVATION MANAGEMENT	2016	industry	pharmaceutical	all countrries	quantitative	secondary	exploration–exploitation learning framework
Miozzo, M; DiVito, L; Desyllas, P	When do Acquirers Invest in the R&D Assets of Acquired Science-based Firms in Cross- border Acquisitions? The Role of Technology and Capabilities Similarity and Complementarity	LONG RANGE PLANNING	2016	primary data	biopharmaceutical	UK (acquirers)	qualitative (case studies)	primary and secondary	prior research on M&A and innovation
McCarthy, KJ; Aalbers, HL	Technological acquisitions: The impact of geography on post-acquisition innovative performance	RESEARCH POLICY	2016	industry	aerospace and defence, compute machinery, pharmaceuticals, ele communications		quantitative	secondary	transaction costs and international business literatures

Wubben, EFM; Batterink, M; Omta, O	Getting post-M&A integration mechanisms tuned in to technological relatedness and innovation synergy realisation	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2016	industry, primary data (M&A recognized as a valuable item for innovation even though innovation enhancement is not the predominant M&A motive)	medium-tech and high-tech industries	EU	qualitative (multiple case studies)	primary and secondary	prior research on M&A integration
Yoon, H; Lee, JJ	Technology-acquiring cross- border M&As by emerging market firms: role of bilateral trade openness	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2016	industry, target innovative activity (patenting activity in the five years preceding to the M&A), announced motive	high-tech	Brazil, Russia, India, China, and Mexico	quantitative	secondary	insitution-based view
Lehmann, EE; Schwerdtfeger, MT	Evaluation of IPO-firm takeovers: an event study	SMALL BUSINESS ECONOMICS	2016	target type (IPO firms)	all industries	Germany	quantitative	secondary	takeovers of entrepreneurial IPO firms
Lin, BW; Chen, WC; Chu, PY	Mergers and Acquisitions Strategies for Industry Leaders, Challengers, and Niche Players: Interaction Effects of Technology Positioning and Industrial Environment	IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT	2015	industry	industrial and commercial machinery manufacturers, electronic and other electrical equipment manufacturers	US	quantitative	secondary	resource-based view, knowledge-based view, prior research on competitive strategy
Lodh, S; Battaggion, MR	Technological breadth and depth of knowledge in innovation: the role of mergers and acquisitions in biotech	INDUSTRIAL AND CORPORATE CHANGE	2015	acquisition announcement in the year before the focal firm applies for a patent	biotechnology	US	quantitative	secondary	prior research on inter- firm knowledge acquisition
Mas, N; Valentini, G	Technology complexity and target selection: the case of US hospital mergers	INDUSTRIAL AND CORPORATE CHANGE	2015	industry	hospitality	US	quantitative	secondary	absorptive capacity, prior research on M&A and innovation
Wubben, EFM; Batterink, M; Kolympiris, C; Kemp, RGM; Omta, OSWF	Profiting from external knowledge: the impact of different external knowledge acquisition strategies on innovation performance	INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	2015	not specified	all industries	Europe	quantitative	secondary	organizational learning
Cattaneo, M; Meoli, M; Vismara, S	Cross-border M&As of biotech firms affiliated with internationalized universities	JOURNAL OF TECHNOLOGY TRANSFER	2015	target industry and type (IPO)	biotechnology	Europe	quantitative	secondary	reverse-internalization theory, signalling theory and economic sociology
Cefis, E; Marsili, O	Crossing the innovation threshold through mergers and acquisitions	RESEARCH POLICY	2015	not specified	manufacturing	Netherlands	quantitative	secondary	prior research on M&A and innovation
Orsi, L; Ganzaroli, A; De Noni, I; Marelli, F	Knowledge utilisation drivers in technological M&As	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2015	industry	biopharmaceutical	North America, Europe	quantitative	secondary	absorptive capacity, prior research on strategic alliances and M&A

Riccobono, F; Bruccoleri, M; Perrone, G	External knowledge sourcing for R&D activities: antecedents and implications of governance mode choice	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2015	motives description (R&D activities were cited either in the 'deal text' SDC field or A&JV or in the 'target full business description' SDC field for M&A)	all industries	US	quantitative	secondary	prior research on strategic alliances and M&A
Yang, CS; Wei, CP; Chiang, YH	Exploiting Technological Indicators for Effective Technology Merger and Acquisition (M&A) Predictions	DECISION SCIENCES	2014	industry	electronics, communications, computer equipment, machinery, pre-packaged software, and chemical	Japana nd Taiwan	quantitative	secondary	prior research on M&A prediction
Ensign, PC; Lin, CD; Chreim, S; Persaud, A	Proximity, knowledge transfer, and innovation in technology- based mergers and acquisitions	INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	2014	industry and acquring fim type (technology-based firms)	ICT	Canada	qualitative (multiple case studies)	primary and secondary	prior resarch on on intra- and inter-organisational knowledge transfer
Kawazoe, M; Abetti, PA	Transition of strategy, marketing, R&D and new product development policies after mergers and acquisitions: a case study of SuperPower Inc. under US, Dutch and Japanese ownership	INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	2014	target type (high-tech entrepreneurial firm)	superconductivity	US (target firms)	qualitative (case study)	primary and secondary	prior researrch on M&A integration
Sabidussi, A; Lokshin, B; de Leeuw, T; Duysters, G; Bremmers, H; Omta, O	A comparative perspective on external technology sourcing modalities: The role of synergies	JOURNAL OF ENGINEERING AND TECHNOLOGY MANAGEMENT	2014	not specified	all industries	Netherlands	quantitative	secondary	RBV, dynamic capabilities, economic theory, prior research on strategic alliances and M&A
Sears, J; Hoetker, G	TECHNOLOGICAL OVERLAP, TECHNOLOGICAL CAPABILITIES, AND RESOURCE RECOMBINATION IN TECHNOLOGICAL ACQUISITIONS	STRATEGIC MANAGEMENT JOURNAL	2014	announced motive	manufacturing	all countries	quantitative	secondary	absorptive capacity
Colombo, M.G., Rabbiosi, L	Technological similarity, post- acquisition R&D reorganization, and innovation performance in horizontal acquisitions	RESEARCH POLICY	2014	primary data (non- innovation related motives included as a dummy variables)	medium and high-tech	EU (cross-border acquisitions)	quantitative	primary	prior research on TA
Rehn, U; Abetti, PA	Transition of R&D and product development procedures after mergers and acquisitions: a	INTERNATIONAL JOURNAL OF	2013	target high innovation capabilities	superconductivity	US (target)	qualitative (case study)	primary and secondary	prior research on M&A and innovation

	case study of Intermagnetics General and Philips Healthcare	TECHNOLOGY MANAGEMENT							
Gantumur, T; Stephan, A	Mergers & acquisitions and innovation performance in the telecommunications equipment industry	INDUSTRIAL AND CORPORATE CHANGE	2012	industry	telecommunications equipment	US and non-US	quantitative	secondary	prior research on knowledge management, M&A and innovation
Hussinger, K	Absorptive capacity and post- acquisition inventor productivity	JOURNAL OF TECHNOLOGY TRANSFER	2012	target innovative activity (target applied for at least one patent at the EPO since its foundation)	manufacturing	Europe	quantitative	secondary	absorptive capacity
Valentini, G; Di Guardo, MC	M&A and the profile of inventive activity	STRATEGIC ORGANIZATION	2012	industry	medical devices and photographic equipment	US	quantitative	secondary	prior research on technology management
Paruchuri, S; Eisenman, M	Microfoundations of Firm R&D Capabilities: A Study of Inventor Networks in a Merger	JOURNAL OF MANAGEMENT STUDIES	2012	industry	pharmaceutical	US	quantitative	secondary	prior research on knowledge management and M&A
Phene, A., Tallman, S., Almeida, P.	When do acquisitions facilitate technological exploration and exploitation?	JOURNAL OF MANAGEMENT	2012	industry	semiconductor	US	quantitative	secondary	organizational learning
van de Vrande, V; Vanhaverbeke, W; Duysters, G	Technology In-Sourcing and the Creation of Pioneering Technologies	JOURNAL OF PRODUCT INNOVATION MANAGEMENT	2011	industry	pharmaceutical	all countrries	quantitative	secondary	prior research on strategic alliances, CVC and M&A
Malik, T	Vertical alliance and vertical integration for the inflow of technology and new product development in the pharmaceutical industry	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2011	industry	pharmaceutical	all countries	quantitative	secondary	prior search on strategic alliances and M&A
Bonardo, D; Paleari, S; Vismara, S	The M&A dynamics of European science-based entrepreneurial firms	JOURNAL OF TECHNOLOGY TRANSFER	2010	target type (science-based entrepreneurial firms)	electronics, IT, pharma & bio, machinery, communications	Europe	quantitative	secondary	matching theory of ownership change, signalling theory
Ransbotham, S; Mitra, S	Target Age and the Acquisition of Innovation in High- Technology Industries	MANAGEMENT SCIENCE	2010	announced motives (technology or product acquisition)	telecommunications equipment manufacturing (acquirers)	all countries	quantitative	secondary	auction perspective
Zaheer, A; Hernandez, E; Banerjee, S	Prior Alliances with Targets and Acquisition Performance in Knowledge-Intensive Industries	ORGANIZATION SCIENCE	2010	industry	high-tech manufacturing and services	US	quantitative	secondary	prior research on alliances and M&A
Al-Laham, A; Schweizer, L; Amburgey, TL	Dating before marriage? Analyzing the influence of pre- acquisition experience and target familiarity on acquisition success in the M&A as R&D type of acquisition	SCANDINAVIAN JOURNAL OF MANAGEMENT	2010						

Makri, M; Hitt, MA; Lane, PJ	COMPLEMENTARY TECHNOLOGIES, KNOWLEDGE RELATEDNESS, AND INVENTION OUTCOMES IN HIGH TECHNOLOGY MERGERS AND ACQUISITIONS	STRATEGIC MANAGEMENT JOURNAL	2010	industry	drug, chemical and electronics	all countries	quantitative	secondary	prior research on technology management
Hussinger, K	On the importance of technological relatedness: SMEs versus large acquisition targets	TECHNOVATION	2010	not specified	manufacturing and service	Germany	quantitative	secondary	absorptive capacity, information asymmetry
Desyllas, P., Hughes, A.	Do high technology acquirers become more innovative?	RESEARCH POLICY	2010	industry	chemicals and allied products, industrial and commercial machinery and computer equipment, electronics and electrical equipment, transportation equipment, measuring, analyzing and controlling instruments; photo graphic, medical and optical goods, and communications	US	quantitative	secondary	prior research on M&A and innovation
King DR, Slotegraaf RJ, Kesner I.	Performance implications of firm resource interactions in the acquisition of R&D-intensive firms	ORGANIZATION SCIENCE	2008	industry and target innovative activity (R&D/sales prior to being acquired of 2% or greater)	chemicals, computer equipment, electronics, aerospace, instruments, communications, and software	US	quantitative	secondary	KBV
Grimpe, C	Successful product development after firm acquisitions: The role of research and development	JOURNAL OF PRODUCT INNOVATION MANAGEMENT	2007	primary data	all industries	Germany, Switzerland, Austria	quantitative	primary and secondary	prior research on M&A
Puranam, P., Srikanth, K.	What they know vs. what they do: How acquirers leverage technology acquisitions	STRATEGIC MANAGEMENT JOURNAL	2007	industry	information technolgoy and pharmaceutical	US	quantitative	secondary	organizational learning, prior research on M&A integration
Kapoor R, Lim K.	The impact of acquisitions on the productivity of inventors at semiconductor firms: A synthesis of knowledge-based and incentive-based perspectives	ACADEMY OF MANAGEMENT JOURNAL	2007	industry	semiconductor	US	quantitative	secondary	knowledge-based and incentive-based perspectives
Cloodt, M; Hagedoorn, J; Van Kranenburg, H	Mergers and acquisitions: Their effect on the innovative	RESEARCH POLICY	2006	target innovative activity (target has any patenting	aerospace and defence, computers and office machinery, pharmaceuticals	North America, Europe and Asia	quantitative	secondary	absorptice capacity, prior research on M&A

	performance of companies in high-tech industries			activity in the 5 years preceding the M&A)	and electronics and communications				
Paruchuri, S., Nerkar, A., Hambrick, D.	Acquisition integration and productivity losses in the technical core: Disruption of inventors in acquired companies	ORGANIZATION SCIENCE	2006	industry	pharmaceutical	US	quantitative	secondary	KBV, prior research on M&A
Puranam, P., Singh, H., Zollo, M.	Organizing for innovation: Managing the coordination- autonomy dilemma in technology acquisitions	ACADEMY OF MANAGEMENT JOURNAL	2006	industry	information technology hardware	US	quantitative	secondary	organizational learning, prior research on M&A integration
Uhlenbruck, K; Hitt, MA; Semadeni, M	Market value effects of acquisitions involving Internet firms: A resource-based analysis	STRATEGIC MANAGEMENT JOURNAL	2006	industry and target activity (on-line internet firms)	high-tech	all countries	quantitative	secondary	RBV, organizational learning
Schweizer, L	Knowledge transfer and R&D in pharmaceutical companies: A case study	JOURNAL OF ENGINEERING AND TECHNOLOGY MANAGEMENT	2005	industry	pharmaceutical	US, Germany, Switzerland	qualitative (multiple case studies)	primary and secondary	prior research on innovation in the pharmaceutical industry
Cassiman, B; Colombo, MG; Garrone, P; Veugelers, R	The impact of M&A on the R&D process - An empirical analysis of the role of technological- and market- relatedness	RESEARCH POLICY	2005	industry	medium- and high-tech industries	US, Europe, China	qualitative (case studies)	primary	financial economics and industrial organisation, prior research on technology management
Graebner, ME	Momentum and serendipity: How acquired leaders create value in the integration of technology firms	STRATEGIC MANAGEMENT JOURNAL	2004	industry	communications and information technology	all countries (both domestic and cross-border acquisitions)	qualitative (multiple case studies)	primary and secondary	prior research on TA
Hagedoorn, J; Duysters, G	External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions	JOURNAL OF MANAGEMENT STUDIES	2002	industry and motives description (M&As for which innovation, R&D or technology were mentioned)	computer related services, R&D and testing services, high-tech sectors	U.S. and non-US	quantitative	secondary	resource-based view, resource dependency view
Vanhaverbeke, W; Duysters, G; Noorderhaven, N	External technology sourcing through alliances or acquisitions: An analysis of the application-specific integrated circuits industry	ORGANIZATION SCIENCE	2002	industry	application-specific integrated circuits	all countries	quantitative	secondary	prior research on strategic alliances and M&A
Kennedy, KH; Payne, GT; Whitehead, CJ	Matching industries between target and acquirer in high-tech mergers and acquisitions	TECHNOLOGY ANALYSIS &	2002	industry	biotechnology, computers, and communications	US	quantitative	secondary	absorptice capacity, prior research on M&A

		STRATEGIC MANAGEMENT							
Hagedoorn, J; Duysters, G	The effect of mergers and acquisitions on the technological performance of companies in a high-tech environment	TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT	2002	industry	computer industry (services excluded)	mainly US	quantitative	secondary	prior research on M&A
Ranft, A. L., Lord, M. D.	Acquiring New Technologies and Capabilities: A Grounded Model of Acquisition Implementation	ORGANIZATION SCIENCE	2002	industry	computer software, biotechnology, computer services, electronics	all countries (domestic acquisitions)	qualitative (multiple case studies)	primary	KBV
Ahuja, G; Katila, R	Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study	STRATEGIC MANAGEMENT JOURNAL	2001	announced motive and target innovative activity (target has any patenting activity in the 5 years preceding the M&A)	chemical	all countries	quantitative	secondary	absorptive capacity
Kreiner, K; Lee, K	Competence and community: post-acquisition learning processes in high-tech companies	INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	2000	industry	electronics	Europe	qualitative (case study)	primary and secondary	community of practice theory
Ernst, H., Vitt, J.	The influence of corporate acquisitions on the behavior of key inventors	R & D MANAGEMENT	2000	both companies performed R&D	mechanical enegeering, electrical engeneering, chemicals	Germany	quantitative	secondary	prior research on M&A and innovation
Hagedoorn, J; Sadowski, B	The transition from strategic technology alliances to mergers and acquisitions: An exploratory study	JOURNAL OF MANAGEMENT STUDIES	1999	motives description	all industries	all countries	quantitative	secondary	prior research on strategic alliances and M&A
Coff, RW	How buyers cope with uncertainty when acquiring firms in knowledge-intensive industries: Caveat emptor	ORGANIZATION SCIENCE	1999	industry (dummy for knowledge-intensity)	all industries	US	quantitative	secondary	prior research on M&A
James, AD; Georghiou, L; Metcalfe, JS	Integrating technology into merger and acquisition decision making	TECHNOVATION	1998	industry	chemicals, materials, electronics and utility	UK	qualitative (multiple case studies)	primary	prior research on M&A

2.3. Descriptive review of the literature

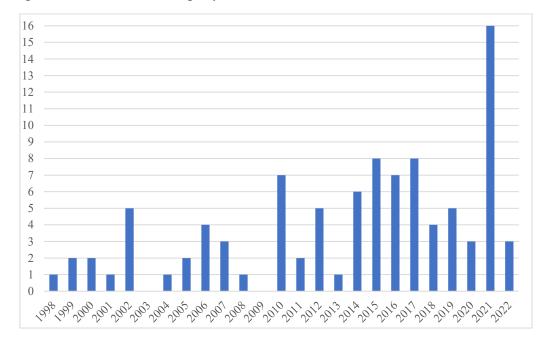
This section reports observations related to years of publication, type of articles published, methods applied and theories used, publication outlets, most prolific and prominent authors, motive categorization, and performance metrics adopted. This allows to provide a preliminary map of the extant research and, consequently, identify possible gaps that could be filled by future research.

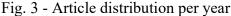
Year of publication, type of paper, method and theories employed

The first published article included in the review dates back to 1998. Since then, the number of articles published on the topic has shown an increasing trend (see Fig. 3), peaking in 2021 (n=16). Therefore, although more than 20 years since this research stream originated have passed, the results clearly demonstrate that academic interest on the topic appears more relevant than ever. In 2001, Bowen (2001) reports in its article on the Harvard Business Review: "acquisitions as a substitute for in-house R&D, is related to product and market extensions, but I'll treat it separately because it's so new and untested". Thus, technological acquisitions, as new forms of acquisition uncommon in practice, and largely unknown in theory as they were in the late 1990s, have increasingly become popular means to innovate, and attracted a growing interest among scholars.

All the articles included in the set of papers are empirical works. Apart from the review study by Christofi *et al.* (2019), which was excluded from the analysis to not include a review work different in scope from the present one, no other literature reviews or meta-analyses are found. Furthermore, no conceptual paper is found within the sample. Regarding empirical papers, in terms of the methodology employed, quantitative methods report the highest frequency, as they are used in 79 studies. The remaining 18 studies apply qualitative methodologies in the form of single or multiple case studies. These studies generally investigate integration-related issues, which are difficult to capture using quantitative methodologies. However, like quantitative papers, many qualitative studies rely on secondary information to measure innovation outcomes (e.g., number of patents, number of citations). Given the above, the qualitative investigation of TA related aspects is suggested to academics, in order to contribute to theory-building. Furthermore, the

development of conceptual contributions can help to strengthen theoretical foundations and enlarge theoretical boundaries. Indeed, the review reveals that most studies draw upon the resource-based view, and the related knowledge-based view, while a number of them build their hypotheses on knowledge and technology management literature.





Journal outlets and citation impacts

The majority of articles are published in journals focusing on technology and knowledge-related topics, as well as top-tier strategy and general management journals. As shown in Table 2, innovation journals that appear in the review include *Technology Analysis and Strategic Management*, which has the highest number of articles included in this review (n=12; 12%), *Research Policy, International Journal of Technology Management, Journal of Technology Transfer, Journal of Product Innovation Management, European Journal of Innovation Management, R&D Management, and Technovation. Within the strategy field, the highest number of relevant contributions is published in <i>Strategic Management Journal* (n=11; 11%), while *Journal of Management Studies* show the highest number of papers

into the general management area (n=5; 5%). Several articles in this review are also published in journals from a range of other disciplines as well, such as Information Management and Organization Studies. Additionally, to understand the impact of publication outlets on the research domain, the sample's number of citations are examined. The 10 most cited articles are Ranft & Lord (2002) (496 citations), Puranam et al. (2006) (426 citations), Puranam & Srikanth (2007) (236 citations), Paruchuri et al. (2006) (217 citations), King et al. (2008) (174 citations), Al-Laham et al. (2010) (141 citations), Miozzo et al. (2016) (136 citations), Kapoor & Lim (2007) (134 citations), Tarba et al. (2019) (132 citations), and McCarthy & Aalbers (2016) (129 citations). The most cited articles are published in *Organization Science*, *Academy of Management Journal*, *Strategic Management Journal*, *Scandinavian Journal of Management*, *Long Range Planning*, *Group & Organization Management*, and *Research Policy*, thus mainly falling within organization, strategy and management journals.

Publication outlet	Ranking ABS	No. of articles	Weight (%)
Technology Analysis & Strategic Management	2	12	12.37
Strategic Management Journal	4*	11	11.34
Research Policy	4*	8	8.25
International Journal of Technology Management	2	6	6.19
Organization Science	4*	6	6.19
Journal of Management Studies	4*	5	5.15
Journal of Technology Transfer	3	4	4.12
Business Strategy and the Environment	3	3	3.09
European Journal of Innovation Management	1	3	3.09
Industrial And Corporate Change	3	3	3.09
Journal of Product Innovation Management	4	3	3.09
Academy of Management Journal	4*	2	2.06
Journal of Engineering and Technology Management	2	2	2.06
Journal of Knowledge Management	2	2	2.06
Management Decision	2	2	2.06
R & D Management	3	2	2.06
Technovation	3	2	2.06
Asia Pacific Business Review	2	1	1.03
British Journal of Management	4	1	1.03
BRQ-Business Research Quarterly	4	1	1.03
California Management Review	3	1	1.03

Chinese Management Studies	1	1	1.03
Decision Sciences	3	1	1.03
European Journal of Information Systems	4	1	1.03
Group & Organization Management	3	1	1.03
IEEE Transactions on Engineering Management	3	1	1.03
Industry And Innovation	3	1	1.03
Information Systems Research	4*	1	1.03
International Journal of Innovation Management	2	1	1.03
Journal of Management	4*	1	1.03
Journal of Management & Organization	2	1	1.03
Journal of Organizational Change Management	2	1	1.03
Journal of Strategy and Management	1	1	1.03
Long Range Planning	3	1	1.03
Management Science	4*	1	1.03
Scandinavian Journal of Management	2	1	1.03
Small Business Economics	3	1	1.03
Strategic Organization	3	1	1.03

Motive categorization

In Table 1, the criteria reported by authors to identify the technological nature of the acquisition are presented. In general terms, it can be observed a lack of consensus on how to operationally define the boundaries of technological acquisitions. Most studies assume that all acquisitions in the high-tech industry, or involving high-tech targets, are motivated by external technology sourcing. Some works consider the patenting activity of the target firms in the years preceding the acquisition, whereas others rely upon disclosed motives or primary data. In some cases, no specific criteria are set to screen and select technological acquisitions, despite the declared objective of the study.

Performance measurement

Table 3 reports performance constructs and measures adopted to assess post-M&A outcomes in the studies reviewed. In doing so, I use the authors' words as much as possible to avoid any misinterpretation of their contribution. A distinction can be drawn between 1) studies investigating M&A overall performance, as measured by abnormal returns/cumulative abnormal returns, profitability, firm value, subjective appraisal of realization of expected value, and 2) studies focusing on innovation performance. In the latter, a variety of dimensions analyzed is observed, ranging from successful utilization of knowledge and capability, to the number of new products launched, R&D intensity, R&D productivity, quality of new inventions,

and inventors' productivity. Hence, innovation performance is measured at different stages of the integration and inventive processes, from knowledge transfer, to R&D inputs (e.g., R&D expenditures and intensity, key inventors' retention), R&D outputs (e.g., patents quantity and quality, reconfiguration of technological portfolios), technology application (e.g., new product launches) and commercialization (e.g., sales coming from innovation). The time period used to assess innovative performance, as well, differs across studies, spanning from one to six years after acquisition.

2.4. Thematic analysis

In this section, the results of the thematic analysis conducted on the studies reviewed is presented. The manual categorization of each study, according to the main theme covered, results in the identification of three macro areas of investigation. Moreover, some sub-themes are detected, which offer a more finegrained view of the topics investigated. Although in many articles more than a single focus is present, I classify them according to the prevailing one. Thus, the following areas of research are identified, as reported in Table 4: 1) decisionmaking on TA, which includes studies dealing with the determinants and outcomes of the decision processes of organizations acquiring external technology, by means of M&As (determinants of the choice to undertake a TA; determinants of the choice between TA versus alternative technology sourcing modes; TA outcomes; TA vs. alternative technology sourcing modes outcomes); 2) target selection, comprising researches that focus on target screening and selection in TA; 3) factors affecting TA success, show studies examining factors related to target selection and integration, affecting TA performance. Findings of the main articles included in each category are presented in the paragraphs that follow.

Table 3 - TA success metrics.

References	Outcome	Metrics
(Yu, Dang and Motohashi, 2019)	inventors' productivity	mean patent output of all inventors, each inventor's patent citation impact (forward citation of a patent within its first 5 years)
(Wu, Yu and Khan, 2021)	innovation performance	number of patents that cited the patents of each acquiring firm following acquisition
(Kwon, Lim and Lee, 2018a)	firm value	Tobin's q
(Hanif, Wu and Babar, 2021)	innovation performance	patent counts of the acquiring firm obtained during 1–4 years after M&A
(Hanelt et al., 2021)	digital performance	digital patents and new or changed market offerings based on digital technologies
(Sedita <i>et al.</i> , 2021)	technological trajectory	degree to which the acquired knowledge matched the developed knowledge, based on technological classes of the cited patents
(Ganzaroli <i>et al.</i> , 2016)	exploitative and explorative invention performance	exploitative invention performance: number of patents an acquirer successfully filed in the six-year window post-M&A within patent classes in which the firm had been active in the six-year window prior to the M&A explorative invention performance: the number of patents a firm successfully applied for in the six-year window post-M&A within patent classes in which the firm had not been active in the six-year window prior to the M&A.
(Issah, 2021)	innovation performance	number of patents of the acquiring firm in the 1–3 years after the acquisition.
(Tarba et al., 2019)	financial performance	perceptions of incumbent executives in the following areas: return on investment (ROI), earnings per share (EPS), stock price, cash flow, and sales growth 2 years after completion of the merger or acquisition growth
(Lodh and Battaggion, 2015)	depth and breadth of innovative activity	depth: the extent to which a patent draws upon a certain technology based on IPC codes; breadth: the range of new technologies
Gantumur, T; Stephan, A	innovation performance	R&D intensity and patent intensity: R&D expenditures and number of patent applications granted scaled by total assets; quality of patents: number of forward citations of patents; R&D productivity: ratio of citation-weighted patent to R&D expenditure; in the three years following a merger
(Zhou et al., 2018)	R&D input, R&D output, financial results from commercialization	R&D input: R&D expenditures, R&D intensity; R&D output: product number, patent quantity, patent quality, patent distribution; financial results from commercialization: operating income (tech M&A related), ratio of M&A related operating income to total operating income
(Wubben et al., 2015)	radical and incremental innovation	radical innovation: the fraction of sales from new products that were new to the market; incremental innovation: the fraction of sales from new products that were new to the company
(Sabidussi et al., 2014)	total innovation	total sales derived from new products, with the share of sales from products new to the market and from those new to the firm considered jointly (scaled by the number of employees)
(Lee and Lee, 2022)	joint knowledge creation	total number of post-M&A joint patents where the inventors were from both the target and acquiring firm
(Shin et al., 2017)	reconfiguration of technological portfolio	existing core areas: technological areas that are found on both the pre- and post-M&A core technological areas lists; enhanced core ares: areas where the acquirer firm was granted patents during the 5 years prior to the M&A new core areas: areas in which the acquirer firm had no patent granted during the 5-year period prior to the M&A.
(Han, Jo and Kang, 2018a)	innovation performance	number of granted patents of the acquirer firm that were applied for between 1 and 5 years after M&A
(Cefis, Marsili and Rigamonti, 2020a)	innovation performance	dummy indicating whether the firm introduced new or significantly improved products/services
(Dunlap et al., 2016)	exploratory and exploitative product innovation	exploratory innovation: index ranking new product applications from lowest to highest level of radicalness based on chemical type and therapeutical potential of drug; exploitative innovation: number of new efficacy supplements or label modifications for an already approved drug
(Grimpe, 2007)	technological success, economic success, integration quality	changes in the patent situation of the combined company and in innovative capabilities; cost advantages resulting from the integration as well as an increase in earnings and market share; avoidance of coordination problems and employee turnover resulting from the integration, keeping to planned costs for the integration as well as the day-to-day practicability and general satisfaction with the integration
(van de Vrande, Vanhaverbeke and Duysters, 2011)	pioneering technologies (explorative innovation)	patent applications in year t that do not cite any other patents
(Muratova, Rigamonti and Wulff, 2019)	exploration and exploitation	exploration: increase in the number of patents filed by the acquirer post-acquisition (comparing 5-year post- and preacquisition patenting) in the target's unique core technology areas; exploitation: increase in the number of patents granted to the acquirer in its core technology areas between the 5 years before acquisition and the 5 years after acquisition
(Harrigan, Di Guardo and Cowgill, 2017)	financial performance	return on assets (ROA)

(Hussinger, 2012)	inventors' productivity	number of patents per inventor in the following five years
(Miozzo, DiVito and Desyllas, 2016)	investments in the technological assets of the acquired firm	percentage of the R&D budget of the combined entity invested in the target's projects
(Fernández, Triguero and Alfaro-Cortés, 2019)	innovation performance	R&D intensity
(Ransbotham and Mitra, 2010)	stock-market reaction	cumulative abnormal returns (CAR)
(Zaheer, Hernandez and Banerjee, 2010)	stock-market reaction	CAR
(McCarthy and Aalbers, 2016)	innovation performance	abnormal returns in terms of the number of patents attributable to the acquisition one year after the acquisition
(Sears, 2018)	integrative and independent innovation	integrative innovation: patents that cite both a pre-acquisition target patent and a pre-acquisition acquirer patent in the seven-year prior to acquisition; independent innovation: patents that cites a pre-acquisition target patent but do not cite a pre-acquisition acquirer patent
(Cefis and Marsili, 2015)	change in innovation activities and output	change in innovation activities: 'New entrant innovators' are firms that change their status from non-innovators in one CIS wave to innovators in the subsequent wave; 'Persistent innovators' are firms that maintain their status of innovators from one CIS to the subsequent one, while 'Exiting innovators' are those that lose their innovative status from one wave to the next. Finally, 'Persistent non-innovators' consist of firms that are non-innovative in one CIS wave and remain in the non-innovative status in the successive wave. Innovation output measured based on percentage turnover of technologically new or improved products/services
(Cloodt, Hagedoorn and Van Kranenburg, 2006a)	innovation performance	number of patents of the acquiring firm obtained during 1-4 years after the M&A
(Cassiman et al., 2005)	R&D process	questionnaire: R&D inputs, R&D outputs, R&D performance, R&D organization and management
(Testoni, 2022)	outsiders' financial performance	outsiders' CAR
(Sears and Hoetker, 2014a)	stock market reaction	CAR
(Ahuja & Katila, 2001)	innovation performance	patent counts of the acquiring firm obtained during 1–4 years after M&A
(Makri, Hitt and Lane, 2009a)	invention quantity, quality, and novelty	patent counts, number of citations for five years after, patent's portfolio extension to a broad range of technology classes, in the three-five years after
(Graebner, 2004)	expected and serendipitous value	expected value: 1) revenues derived from acquired technologies; (2) retention of key acquired employees; and (3) managers' perceptions of acquisition performance
(Ng and Stuart, 2022)	employee retention	employee turnover
(Valentini and Di Guardo, 2012)	depth and breadth of innovative activity	depth: forward citations of patents; breadth: patents citations from a wide range of classes
(Wubben, Batterink and Omta, 2016)	innovation synergies	innovation cost synergy, innovation process synergy, and new growth platforms
(Zhao, Lin and Hao, 2019)	innovation performance	new patents applied after M&A (two year lagged measure)
(Orsi et al., 2015)	knowledge utilization	total number of citations that the target firm's patents get from the acquiring firm's patents during the post M&A period, divided that by the total number of acquirer patents produced in the same period
(Yoon and Lee, 2016)	stock-market reaction	CAR
(Riccobono, Bruccoleri and Perrone, 2015)	innovation performance	number of patents granted to the focal firm, with issue dates between the date the deal was effective and the same date three years after
(Hagedoorn and Duysters, 2002b)	innovation performance	number of patents that firms applied for in all IPC classes in the six years after M&A
(Chen, Ge and Liu, 2021)	knowledge-network reconfiguration	internal knowledge-network reconfiguration, based on total patent of both parties 3 years before (and after) M&A and network index values of each period; external knowledge-network reconfiguration, based on enterprises' connection measured by the joint application and citation information of each patent of both parties in the first 3 years before to 3 years after the M&A.
(Chen, Li and Meng, 2017)	stock-market reaction	CAR
(Ma and Liu, 2017)	innovation performance	number of patent applications in the very year of the acquiring firms
(Malik, 2011)	new product development	clinical trials activities as a new drug development
(Si, Liu and Zhang, 2021)	innovation performance	questionnaire: number of an individual firm's patent applications
- /		

(Paruchuri, Nerkar and Hambrick, 2006)	inventors' productivity	1) inventors' patent applications over the five years following acquisition; 2) sum of citation-weighted patent applications over the five years following acquisition
(Paruchuri and Eisenman, 2012)	inventors' centrality in the intra-firm network	count of patent citations in a year
(Puranam, Singh and Zollo, 2006)	innovation performance	counts and dates of new products introduced by an acquirer
(Puranam and Srikanth, 2007)	knowledge and capability leverage	number of patents filed by the acquirer post-acquisition that cite a previous acquired firm patent and at least one acquired firm inventor is among the authors of these patents
(Phene, Tallman and Almeida, 2012)	exploration and exploitation	exploration: increase in the number of patents filed by the acquirer post-acquisition (comparing 5-year post- and preacquisition patenting) in the target's unique core technology areas; exploitation: increase in the number of patents granted to the acquirer in its core technology areas between the 5 years before acquisition and the 5 years after acquisition
(Kapoor and Lim, 2007)	inventors' productivity	total number of granted patents filed by an inventor with a focal firm in a given year after a relevant acquisition date
(King, Slotegraaf and Kesner, 2008)	stock-market reaction	Jensen's alpha
(Desyllas and Hughes, 2010)	innovation performance	R&D intensity and R&D productivity
(Ernst and Vitt, 2000)	inventors' innovative performance	inventive performance of a key inventor during the three years after acquisition compared to the period of eight years before the acquisition, in terms of patenting activity and patenting performance
(Colombo and Rabbiosi, 2014)	innovation performance	more patents granted, development of new technological competencies, greater speed in developing technological knowledge
(Calza, Parmentola and Tutore, 2021)	environmental performance	CSRHub Environmental Index
(Uhlenbruck, Hitt and Semadeni, 2006)	stock-market reaction	abnormal return on day of acquisition announcement (AR)
(Lehmann and Schwerdtfeger, 2016)	financial performance	AR

Tab	ole 4 -	Theme-	based	anal	vsis	of	articl	es

Main themes	Contributions
Decision-making on TA	
Determinants of the choice to undertake a TA	(Lin, Chen and Chu, 2015; Mawson and Brown, 2017 Chen et al., 2020; Arroyabe, 2021; Rios, 2021)
Determinants of the choice between TA vs. alternative technology sourcing modes	(Hagedoorn and Sadowski, 1999; Hagedoorn an Duysters, 2002a, 2002b; Vanhaverbeke, Duysters an Noorderhaven, 2002; Riccobono, Bruccoleri and Perron 2015; Caviggioli <i>et al.</i> , 2017)
TA outcomes	(Ernst and Vitt, 2000; Ahuja and Katila, 2001b; Clood Hagedoorn and Van Kranenburg, 2006a; Uhlenbruck, H and Semadeni, 2006; Desyllas and Hughes, 201 Gantumur and Stephan, 2012; Cefis and Marsili, 201 Lehmann and Schwerdtfeger, 2016; McCarthy ar Aalbers, 2016; Ma and Liu, 2017; Di Guardo, Harrigr and Marku, 2019; Fernández, Triguero and Alfaro-Corté 2019; Zhao, Lin and Hao, 2019; Hanelt <i>et al.</i> , 2021; Han Wu and Babar, 2021; Issah, 2021; Ng and Stuart, 2022)
TA vs. alternative technology sourcing modes outcomes	(Malik, 2011; van de Vrande, Vanhaverbeke au Duysters, 2011; Sabidussi <i>et al.</i> , 2014; Wubben <i>et a</i> 2015; Dunlap <i>et al.</i> , 2016; Calza, Parmentola and Tutor 2021)
<u>Target selection</u>	(Coff, 1999; Kennedy, Payne and Whitehead, 200 Bonardo, Paleari and Vismara, 2010; Hussinger, 201 Ransbotham and Mitra, 2010; Yang, Wei and Chian 2014; Cattaneo, Meoli and Vismara, 2015; Mas an Valentini, 2015; Marra, Carlei and Baldassari, 202 Chondrakis, Serrano and Ziedonis, 2021; Nakagawa an Nakaya, 2021; Roh, Hwang and Park, 2021; Wu an Reuer, 2021b)
Factors affecting TA success	
Target selection-related issues (pre-merger phase)	(Ahuja and Katila, 2001b; Hagedoorn and Duyste 2002c; Cassiman <i>et al.</i> , 2005; Cloodt, Hagedoorn and V Kranenburg, 2006a; Kapoor and Lim, 2007; Kir Slotegraaf and Kesper, 2008; Makri Hitt and La

	Slotegraaf and Kesner, 2008; Makri, Hitt and Lane,
	2009a; Al-Laham, Schweizer and Amburgey, 2010;
	Zaheer, Hernandez and Banerjee, 2010; Phene, Tallman
	and Almeida, 2012; Valentini and Di Guardo, 2012; Sears
	and Hoetker, 2014b; Lodh and Battaggion, 2015; Orsi et
	al., 2015; Ganzaroli et al., 2016; Miozzo, DiVito and
	Desyllas, 2016; Harrigan, Di Guardo and Cowgill, 2017;
	Ma and Liu, 2017; Öberg and Leminen, 2017; Han, Jo and
	Kang, 2018b; Kwon, Lim and Lee, 2018a; Sears, 2018;
	Zhou et al., 2018; Muratova, Rigamonti and Wulff, 2019;
	Cefis, Marsili and Rigamonti, 2020a; Brueller and
	Capron, 2021; Sedita et al., 2021; Wu, Yu and Khan,
	2021; Lee and Lee, 2022; Testoni, 2022)
Integration-related issues (post-merger phase)	(Chen et al., 2017, 2021; W. Chen et al., 2021; Colombo
	& Rabbiosi, 2014; Ensign et al., 2014; Graebner, 2004;
	Grimpe, 2007; Hussinger, 2012; James et al., 1998;
	Kawazoe & Abetti, 2014; Kreiner & Lee, 2000; Paruchuri
	et al., 2006; Paruchuri & Eisenman, 2012; Puranam et al.,
	2006; Puranam & Srikanth, 2007; Ranft & Lord, 2002;
	Rehn & Abetti, 2013; Schweizer, 2005; Shin et al., 2017;
	Tarba et al., 2019; Wubben et al., 2016; Yu et al., 2019)

2.4.1. Decision-making on TA

Determinants of the choice to undertake a TA. The studies reviewed generally agree that technological acquisitions are pursued with a twofold intent. First, obtaining promising product-related technologies owned by the target firm to be rapidly commercialized (e.g., Graebner, 2004). Second, getting access to critical resources, in terms of patents and innovative capabilities embedded in the knowledge of individuals and teams within the acquired firm, that can complement the company's own research activity (e.g., Schweizer, 2005), thus supporting its long-term growth and innovation strategy.

A group of studies specifically investigates what factors can drive a firm's decision to acquire technology by means of M&A. The work by Rios (2021), for instance, opens with the following question: "why do some firms routinely acquire more than others?". The author proposes and demonstrates that the feasibility of the change needed to start engaging in M&A increases during periods of heightened plasticity, i.e., when the firm's ability to adapt to its environment is stronger (for example in the transition period from private to public). Furthermore, firms with plasticity in munificent times for TA are suggested to be more likely to maintain this channel as part of their regular strategic repertoire. The role played by industry factors in explaining the pattern of innovation-driven acquisitions is outlined as well (Chen et al., 2020; Lin et al., 2015). Specifically, the implementation of TA strategies is found to be affected by a firm's competitive positioning: niche players are likely to be more aggressive in leveraging their technology positions to innovate by means of M&A, whereas leaders tend to harness their market position and use M&As to further strengthen their market power (Lin, Chen and Chu, 2015). Furthermore, rival firms' innovative behavior is suggested to impact a firm decision to undertake a TA (Chen et al., 2020). Indeed, its propensity to acquire is triggered by news about competitors' innovation activities (for example, the winning of awards for technology breakthroughs), and this tendency is more pronounced among firms with confident CEOs and in industries with a shorter technology lifecycle and a higher R&D intensity (Chen et al., 2020). Additionally, two different approaches to TA emerges from the review. On one hand, the study by Arroyabe (2021), conducted in the pharmaceutical industry, suggests that companies resort to acquisitions as a defensive, short-term solution to bring bundles of resources into the firm and replenish its patent portfolios, consequently to patents expiration. On the other hand, the work by Mawson & Brown (2017), examines the case of an entrepreneurial acquisition carried out by a small and medium enterprise (SME), unveiling that small acquirers possess an acute propensity for risk, a desire for close customer engagement, effective business models and strong external orientation. This supports the argument that small firms can adopt a proactive approach to external knowledge acquisition.

Determinants of the choice between TA vs. alternative technology sourcing modes. Some studies analyze TA decision-making compared to alternative governance modes, i.e., strategic alliances, to externally acquire technology and knowledge for innovation purposes. Some authors, for instance, examine whether strategic alliances are conceived by companies as vehicles for acquisitions. Hagedoorn and Sadowski (1999), in their study, assume the transformation of alliances through an encroachment of partners; however, they find little support for the encroachment thesis, suggesting therefore that alliances and M&As are hardly part of a continuum, where one mode leads to the other. By contrast, Vanhaverbeke, Duysters and Noorderhaven (2002) contend that a series of strategic alliances between two partners increases the probability that one will ultimately acquire the other. However, according to the authors, whereas previous direct contacts tend to lead to an acquisition, this is not true for previous indirect contacts, which increase the probability to form a strategic alliance, once a link between the companies has been established. Furthermore, in case of acquisitions, firms that are more centrally located in the network of interfirm alliances tend to be acquirers, while those with a less central position tend to become acquired (Vanhaverbeke, Duysters and Noorderhaven, 2002). In a subsequent study, Hagedoorn and Duysters (2002a) focus on environmental factors affecting the choice about pursuing innovation through strategic alliances or M&As. Their results suggest that the industrial and technological environment in which companies operate plays a significant role in this respect. More specifically, the more the companies operate in high-tech sectors, the more disproportionate the preference for strategic technology alliances is. By

contrast, for lower levels of industry's technology intensity (food and beverages, metals and oil and gas sectors), M&As are likely to become the main mechanism for the integration of external sources of innovation; yet, in medium-tech industries, such as the automotive, instruments and chemical industries, mixed strategies are preferred. Riccobono et al. (2015) show that industry specialization also represents a relevant factor in decision-making, so that the higher the degree of industry specialization, the higher the likelihood that the firm will choose alliances and joint ventures (A&JVs) over M&As. Yet, firm-specific factors, such as the type of knowledge/technology to be acquired, are found to affect such decision. Indeed, M&As are preferred where knowledge to be transferred is related to the core business, otherwise companies are more likely to get involved in strategic technology alliances, to avoid uncontrolled technology transfer (Hagedoorn and Duysters; 2002a). Further, Caviggioli et al. (2017), by comparing the features of technology acquired by means of corporate M&As vs. markets for technology, observe that, while the latter protect less complex inventions with a higher technical merit and often in non-core technology areas, companies resort to acquisition strategies when patented technologies require specific know-how to be deployed. Still, the level of a firm's internal resources and capabilities relatedness to the deal and its innovation experience are found to be positively associated with the likelihood for a firm to choose M&As over A&JVs (Riccobono, Bruccoleri and Perrone, 2015).

TA outcomes. A stream of articles focuses on the outcome of technological acquisitions, particularly their impact on firm innovation performance. By comparing technological vs. non-technological acquisitions, some authors highlight that TA positively impact subsequent innovation outputs, whilst the effect of non-technological M&A is found to be negative (Ahuja and Katila, 2001b; Cloodt, Hagedoorn and Van Kranenburg, 2006a; Ma and Liu, 2017). However, results concerning TA impacts are mixed across studies. Evidence supporting a positive impact can be found in Cefis & Marsili (2015), Zhao et al. (2019), Fernández et al. (2019), Hanelt et al. (2021), Gantumur and Stephan, (2021), whereas other studies report a negative effect. For instance, Desyllas & Hughes (2010) find a negative impact on the acquiring firm's R&D-intensity and R&D productivity, particularly

in the first year following acquisition, while Ernst & Vitt (2000) observe that after M&As, target's key inventors leave the company or reduce their patenting performance. Several contingencies are highlighted as well. For instance, deal size is found to have an inverted U-shaped effect on post-acquisition innovation performance (Zhao, Lin and Hao, 2019). Additionally, post-acquisition R&D investments, by improving firm absorption capacity, extend the positive effect interval of M&A size on innovation performance (Zhao, Lin and Hao, 2019). By investigating cross-border technological acquisitions by developed economies acquiring firms in China, Hanif et al. (2021) find that institutional distance negatively moderates the relationship between acquired ownership and postacquisition innovation performance. Similarly, geographic distance has a negative impact (McCarthy and Aalbers, 2016). By contrast, 'foreignness', i.e., the crossborder nature of the deal, appears to be an 'asset' instead of a 'liability' (McCarthy and Aalbers, 2016). Organizational features also influence the impact of TA on firm performance. For instance, Cefis & Marsili (2015) support that the positive effect of M&A on firm innovation is stronger for large firms; in small firms, M&As help to cross the 'innovation threshold', but do not mitigate their tendency to be occasional innovators.(Ernst and Vitt, 2000)

TA vs. alternative sourcing modes outcomes. Similarly, some studies investigate the impact of different governance modes on the firm innovation performance. For instance, based on a sample of 250 pharmaceutical firms, Malik (2011) examines the linkage between the external technology-sourcing mode and an increase in clinical trials activities for new product development. He finds out that JVs and vertical M&As are more effective than licensing. However, by comparing JVs and M&As, the former appears to be more effective than the latter for new product development. Still drawing on a sample of companies from the pharmaceutical industry, van de Vrande et al. (2011) show that strategic alliances and corporate venture capital (CVC) investments have a positive effect on the creation of pioneering technologies, whereas the effect of TAs is found to be negative. However, according to Dunlap et al. (2016), on one hand, M&As are associated with diminished exploratory product innovation, on the other hand, assimilating external knowledge sourced from JVs leads to a reduction in new exploitative

product innovation. By contrast, Wubben et al. (2015) find that licensing tends to produce more incremental innovations, inter-organizational collaboration allow both long-term and short-term innovation, while M&As have a major impact on the production of long-term radical innovations. Sabidussi et al. (2014), however, support that synergies exist among external sourcing modalities. Hence, integrating different external sourcing modes is more effective than specializing in a single mode, especially when the specialization is focused on M&As. Similarly, Si et al. (2021), by comparing different R&D internationalization modes (cross-border R&D collaboration, setting up offshoring R&D centers and transnational M&As) among Chinese companies, find that pursuing multiple R&D internationalization behavior forms simultaneously is beneficial for firms.

2.4.2. Target selection

Under this grouping fall studies that primarily aim to investigate variables affecting the likelihood of firms to be targeted in TA. For instance, drawing upon signaling theory, Cattaneo et al. (2015) highlight that the affiliation of high-tech ventures with prestigious and internationalized universities functions as a quality signal that reduces information asymmetry, resulting in higher firms' evaluations and higher probability to be targeted in M&A operations, even more in cross-border deals. Other signals of target quality, and particularly technical quality (patents, patent citations, and positive analyst coverage), are found to increase the likelihood of acquisition, whilst this decreases when firms have capital and resources to operate without being acquired (Ransbotham and Mitra, 2010). According to Wu & Reuer (2021), the different level and type of experience of the acquiring firm is able to affect its attention to signals sent by innovative firms. Particularly, general acquisition experience can lead an acquirer to pay more attention to and act on signals, whilst target-specific experience, developed from prior collaborations, can reduce the value of signals by directly mitigating an acquirer's risk of adverse selection. Furthermore, Ozmel et al. (2017) demonstrates that, in the decision to acquire technology ventures, established companies infer information about the underlying value of potential targets by observing other acquisitions, i.e., the

changes in the number of prior acquisitions or the changes in the prominence of prior acquirers within the focal venture's subfield. The influence of such informational cues is more pronounced when exogenous technological uncertainty within the venture's subfield increases, and when there are significant differences between the focal venture and the acquirer's technological resource (Ozmel et al., 2017). Chondrakis et al. (2021) address the information dilemma associated with technology-intensive companies by investigating the impact of an information shock (i.e., the U.S. American Inventors Protection Act, 1999) on the market for technological acquisitions. The authors find that greater disclosure of technological information to the public, is associated with an increase in acquisition activity and technological distance between matched pairings; however, it also decreases acquirers' returns on average. Yang et al. (2014) develop and empirically test a target prediction model, providing evidence that the incorporation of the technological profiles and compatibility of both bidder and candidate target companies as predictors, is a crucial aspect for effective predictions of technology M&A. The study by Marra et al. (2020) examines the concept of 'proximity' in broader terms, thus referring to 'business proximity' (i.e., similarity in terms of products, services and technologies) and 'strategic proximity' (i.e., complementarities developed internally by firms). They propose a methodological support, based on network analysis, for the screening of potential partners for collaboration and knowledge exchange. By comparing proximity values of firms that actually carried out an M&A operation, the authors show that both business and strategic proximity are effectively taken into consideration by acquiring firms, to specialize on the core business and opening up technological scenarios respectively. Hussinger (2010), based on a marriage market type of model where each acquirer chooses the preferred acquisition target from a pool of potential targets, further supports that technological proximity is positively associated with the likelihood of SME target firms to be acquired. However, it is found that there is no significant effect for larger firms. Conversely, Mas & Valentini (2015) observe that in the hospitality sector, acquiring firms are more likely to choose targets with lower levels of technological relatedness, and, especially, they prefer to acquire additional technologies, which are complex and difficult to replicate. According to

Nakagawa & Nakaya (2021), the choice between technological exploitative (with lower technological relatedness) and explorative (with higher technological relatedness) acquisitions, is dependent upon the acquirers' competitive positioning: the more profit potential the current positioning endows, the more the company will choose exploitative technology acquisitions to maintain that positioning; otherwise, it will tend to undertake explorative acquisitions to change its positioning. Yet, two authors among the reviewed articles take into consideration the impact of proximity/relatedness dimensions on deal's characteristics. First, Coff (1999) provides evidence that when the two firms draw on related forms of expertise, buyers resort to acquisition strategies involving lower bid premia, contingent payment, lengthy negotiations and avoidance of tender offers. Second, Kennedy et al. (2002) find that deals are larger in ownership percentages and transaction size if the target firm is from the same industry of the acquiring firm.

2.4.3. Factors affecting TA success

This broad group of studies comprises works whose primary focus is the investigation of factors influencing TA success. Most studies relate to M&A performance in terms of innovative outcomes, while others refer to the overall acquisition performance. Two subcategories of studies are further identified according to whether antecedents of TA outcomes mainly focus on target selection (pre-merger stage) or integration (post-merger stage).

Target selection-related issues. The type of knowledge acquired from the target represents a crucial aspect, investigated in relation to the successful innovative outcome of TA. Some studies consider the impact of the size of knowledge acquired on firm innovation performance after acquisition (Ahuja & Katila, 2001; Cassiman et al., 2005; Cloodt et al., 2006; Makri et al., 2009). In their influential paper, Ahuja & Katila (2001) find out that, while the absolute size of the target knowledge base enhances innovation performance, the relative size reduces innovation output. This results are corroborated by Cloodt et al. (2006) who, however, further demonstrate that the absolute size only has a positive effect during the first couple of years, after

which the effect becomes negative. Hagedoorn & Duysters (2002b), by referring to the 'depth' of knowledge acquired to indicate the complementarity of firms' actual research, provide evidence that merging with technologically more advanced partners lead to positive innovative outcomes. Besides the size of the knowledge acquired, the concept of 'technological relatedness' or 'overlap' stands out as a prominent aspect of research, where the term has been referred to as the degree to which companies are active in particular fields of technology that they share with (potential) partners in M&As (Hagedoorn and Duysters, 2002b; Cassiman et al., 2005). In this respect, Ahuja & Katila (2001), and subsequently Cloodt et al. (2006), provide strong evidence for a nonlinear (inverted-U shape) relationship, thus suggesting the existence of a trade-off between exploration and exploitation of the target's knowledge base. Other authors rather leverage the concepts of knowledge 'similarity' and 'complementarity', to better capture the multi-faceted nature of technological relatedness (Makri, Hitt and Lane, 2009a; Valentini and Dawson, 2010). In this regard, according to Cassiman et al. (2005), higher levels of complementarity are associated with an increase in the R&D level and R&D efficiency after the acquisition, which suggests a scope economy effect of M&A, rather than a scale economy effect. Furthermore, where merged entities are technologically substitutive, the reduction of R&D is found to be more prominent for merging rival firms than non-rivals. Makri et al. (2009) show that both complementary scientific and complementary technological knowledge contribute to post-merger invention performance by stimulating higher quality and more novel inventions. While similarities facilitate incremental renewal, complementarities are more likely to lead to discontinuous strategic transformations (Makri, Hitt and Lane, 2009a). In the studies by Phene et al. (2012) and Muratova et al. (2019), the extent of target firm technological uniqueness is found to lead to an explorative behavior after acquisition, further enhanced by geographical proximity between the acquirer and the target. Similarly, Ganzaroli et al. (2016)' findings support that the utilization of similar knowledge significantly affects only exploitative invention performance, while the utilization of complementary knowledge influences both, although it influences exploration more than exploitation. Shin et al. (2017) support that neither similarity, nor complementarity are advantageous for innovation in the

existing core areas, whereas similarity facilitates innovation in the enhanced core areas, and complementarity is beneficial for innovation in the new core areas. However, the case study of L'Oreal by Sedita et al. (2021) challenges these findings. They suggest that, even if TAs enable companies to get access to complementary or unrelated knowledge from the target, the acquirer shows a tendency to use the acquired knowledge for reinforcing its specialization. Hence, radical innovation can derive from recombination of close knowledge, and not necessarily from the exploration of distant knowledge. The positive effects of acquiring similar knowledge are indeed outlined by other scholars (for instance, Han et al., 2018b; Kapoor & Lim, 2007; Orsi et al., 2015). Knowledge similarity favors acquirers' efficiency in the assimilation and use of the knowledge acquired in the M&A (Orsi et al., 2015), positively impacting R&D input and output (Zhou et al., 2018), especially when it is about 'high-quality' overlap (Han, Jo and Kang, 2018b), also enhancing joint knowledge creation (Lee & Lee, 2022; Sears, 2018). However, only moderate levels of overlap in skills produce beneficial consequences on acquired inventors' productivity (Kapoor and Lim, 2007). Additionally, knowledge similarity deteriorates the information asymmetries between targets and acquirers, leading to greater acquirer's interventions into target innovative activities that delay independent innovation (Sears, 2018). Concerning this latter aspect, by investigating how the target firm's technology is developed post-acquisition, Miozzo et al. (2016) propose a conceptual framework, where different outcomes in terms of investment in the acquired firm's R&D assets are expected from the interaction of two factors, i.e., the complementarity/similarity of the technology, and the complementarity/similarity of the discovery and development capabilities of the target and acquiring firm. In the presence of similar knowledge bases (both in terms of technology and discovery and development capabilities), efforts observed are limited to the "transfer" or "translation" of intellectual property documentation to the buyer, but the retention of technical and scientific staff is not seen as necessary to continue the exploitation of these capabilities. By contrast, where both dimensions are complementary, then the acquisition emphasizes both "exploration" and "exploitation", as it provides the acquirer with a foothold into a

new domain, and the option to build on that platform with further internal investment or a series of follow-on acquisitions.

Other scholars analyze the types of acquired knowledge in relation to the financial performance post-acquisition. Findings presented by Zhou et al. (2018), who conduct case studies on China's high-tech firms, indicate that M&As without technology relatedness have better financial performance, since they lead acquirers to new technology sectors or sub-sectors. Sears & Hoetker (2014) show that, as the target overlap (the portion of the target's knowledge already known by the acquirer) increases, each unit of target capabilities generates less value. These findings suggest that the negative impact of increased redundancy outweighs the benefits of increased absorptive capacity. By contrast, when the target overlap is low, there does not seem to be a negative impact from a lack of absorptive capacity. Further, a high acquirer overlap (acquirer's existing knowledge duplicated by the target's knowledge) negatively affects the acquirer's ability to extract value from the target's capabilities, but only when there is simultaneously a high target overlap. According to King et al. (2008), complementary resource profiles in target and acquiring firms are associated with abnormal returns. Specifically, acquiring firm's marketing resources and target's technology resources positively reinforce (complement) each other; meanwhile, acquiring and target firms' technology resources negatively reinforce (substitute) one another. By focusing instead on the market value spillovers generated by TAs, Testoni (2022) finds out that firms that own patents similar to the company being acquired, experience positive stock market returns at the acquisition announcement of the focal technology acquisition. This suggests that the deal signals to investors that the acquired technological resources are more valuable than initially expected.

Some studies address market or industry relatedness considerations. By differentiating among entered, complementary and upgraded TAs based on industry relatedness, Ma & Liu (2017) provide evidence that a positive impact is observable when acquiring firms both in the high-tech sector but in a different industry merge; whereas a negative and insignificant effect is shown for firms outside the high-tech sector merging with high-tech targets, and for firms operating in the same high-tech industry, respectively. By contrast, other authors point out the beneficial effects of

related M&As on post-acquisition innovative performance. For instance, Valentini & Di Guardo (2012) argue that the profile of firms' inventive activity depends on two main factors, namely the resources available to be recombined and the organizational incentives that guide the recombination process: the first depends on the upstream, technological resources available; the latter on the firms' downstream, product-market related assets. They show that diversity in downstream resources exerts a positive impact on the post-acquisition profile of inventive activities, whereas diversity in knowledge bases displays a positive effect only in deals characterized by high market relatedness, namely when the probability of integrating is higher. According to Lodh & Battaggion (2015), related and unrelated M&As positively impact two distinct outcomes, i.e., the creation of depth and breadth of knowledge, respectively. Sector familiarity is also found to increase the post-acquisition patenting speed (Al-Laham, Schweizer and Amburgey, 2010). Cefis et al. (2020), however, provide support for the existence of a curvilinear relationship between industry relatedness and post-acquisition innovative performance. Its shape can be altered by two factors, i.e., the level of internal R&D and the firm's acquisition experience, which may modify the level of industry relatedness maximizing post-acquisition innovative performance, and the size of the potential losses in post-acquisition innovative performance that would be incurred, respectively. Industry relatedness is also found to affect the market value of firms acquiring innovative start-ups. In this respect, the study by Kwon et al. (2018), focused on the acquisition of energy startups, suggests that M&As carried out by firms operating in the energy sector negatively affect the firm value of the acquirer, due to the high eco-premiums deriving from increased demand for acquisitions. However, such acquisitions positively impact the firm value of firms in environmentally sensitive industries (paper, chemicals, petroleum and metals).

Integration-related issues. The studies reviewed generally support that the strategic approach to integration, i.e., the level of integration, which also determines the amount of resource transferred, needs to be adjusted to the intended use of the acquired resources and capabilities. The article by James et al. (1998) suggests, indeed, that following an autonomy approach is the most appropriate choice where the acquisition of technology is the main objective (this is the case, for instance, of

large pharmaceutical companies acquiring small biotechnology firms), since it allows to preserve the distinctive technological capabilities of the acquired firm and to provide it with complementary assets from the new parent. A coordination approach instead is preferred where both the acquired business and its new parent have distinctive technological capabilities that can be combined to create technological synergies. Finally, integration is beneficial when the acquirer seeks to generate value by creating technological synergies through rationalization and combination of the acquired technological assets, thus prioritizing efficiency gains at the expenses of firms' distinctive capabilities. Puranam & Srikanth (2007) look into the apparent paradox that integration can both enable and hinder the efforts to benefit from externally acquired knowledge, due to integration mechanisms that can enhance knowledge transfer and coordination, but that can also significantly disrupt organizational processes by reducing a target's organizational autonomy. They find that if the acquirer intends to leverage the target's capability as a source of ongoing innovation (knowledge exploration), then a structural integration which is associated with a loss of autonomy – negatively impacts the innovation outcomes. By contrast, the use of target's knowledge base as input for the company's own innovation processes (knowledge exploitation) benefits from a full integration. Further, in Puranam et al. (2006), the coordination-autonomy dilemma is examined considering the different stages of the innovation trajectories of acquired firms. Their findings support that structural integration is optimal when it does not coincide with the most exploration-intensive phases in a series of innovations. The study by Grimpe (2007) shows that companies typically revert to three distinct integration strategies, depending on the need for strategic interdependence and organizational autonomy: symbiosis, absorption, and adjustment. The author finds that new product development capabilities benefit most from symbiosis, which implies both strategic interdependence and organizational autonomy, and from absorption, which needs high strategic interdependence but low organizational autonomy. Further, integration instruments represented by structurally linking R&D units and by the standardization of systems, positively impact technological and economic success (Grimpe, 2007). Wubben et al. (2016), building on nine case studies, examine the interrelations

between M&A characteristics (i.e., technological relatedness), post-M&A integration (i.e., structural linking, system standardization, and process re-design) and innovation synergies (i.e., innovation cost synergy, innovation process synergy, and new growth platforms). Their findings show that a higher degree of technological relatedness seems to allow companies to realize more types of innovation synergies, brought about by more substantial levels of integration, i.e., process redesign. No innovation synergies are found to be related to the lowest level of R&D integration, i.e., system standardization. Innovation cost synergies seem to require the highest level of R&D integration (process re-design mechanism), while innovation process synergies and new growth platforms benefit from structurally linking companies, which facilitates the sharing of best practices and state-of-theart technologies. By leveraging a sample of overseas acquisitions carried out by Chinese acquirers, the results by Chen et al. (2021) further support that in presence of a higher resource complementarity, combined with a lower external network embeddedness, the acquirer should choose a lower integration strategy to improve internal and external knowledge-network reconfiguration, which in turns benefits home-country industrial innovation. Likewise, Schweizer (2005) observe that, in the pharmaceutical industry, large companies acquiring small biotech firms that are supposed to add new R&D competencies, preserve their autonomy and turn them into centers of excellence. This takes place instead of trying to get access and transfer their skills, which are very specific and embedded in some kind of local knowledge network and, therefore, difficult to transfer without losses. The study by Paruchuri, Nerkar, and Hambrick (2006) confirm that integration is harmful for inventors' productivity, particularly for those who are most socially embedded in collaborative relationships with their pre-acquisition colleagues and whose expertise diverges from the acquirers' one. Ranft & Lord (2002) argue that greater autonomy facilitates the preservation of an acquired firm's tacit and/or socially complex knowledge, due to higher employee retention rates. Moreover, a slow acquisition implementation is proposed to help preserving such knowledge, but a high degree of autonomy for a prolonged period of time, is also likely to prevent any possibilities for knowledge transfer (Ranft and Lord, 2002).

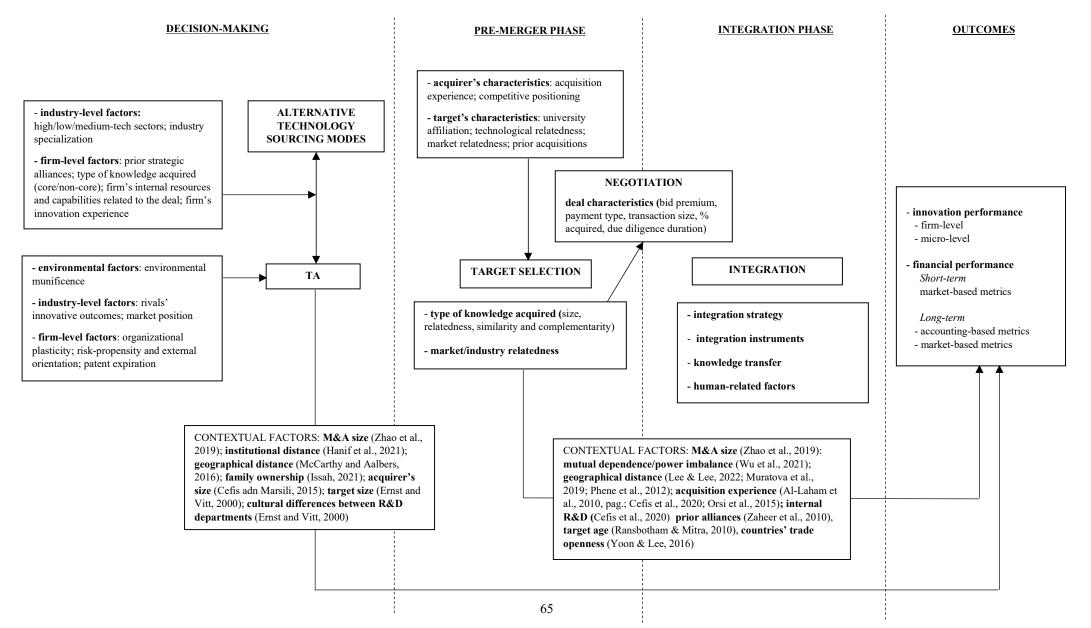
Some studies also contend that the effectiveness of knowledge transfers is affected by the acquirer and target firms' strategic and cultural proximity levels. In this respect, the case studies by Ensign et al. (2014) provide insights to what extent geographic, cognitive, and organizational proximity impact knowledge transfer and innovation post-M&A. Findings show that physical proximity facilitates building trust and strong relationships that enhance knowledge transfer. Sharing significant knowledge helps communicating more effectively on technological issues and, consequently, successfully transferring knowledge. However, differences in the domain of expertise are needed to move beyond incremental innovation. Finally, organizational proximity eases knowledge transfer and allows collaborations to happen more naturally and efficiently. The case study by Yu et al. (2019), presenting Lenovo's acquisition of IBM's PC division, stands in line with previous research, by showing that a 'light-touch' integration approach preserves the inventive productivity of inventors of the acquired firm, and that the knowledge gap between the two companies hampers intra-firm knowledge transfers to veteran inventors. Nonetheless, the acquisition creates opportunities to improve the acquirers' technological capability by sourcing new talent globally. Hussinger (2012) also highlights that the acquirer's absorptive capacity is crucial in enhancing the integration of inventors after firm takeovers, as demonstrated by the significantly higher levels of inventive activity shown by companies with a distinctive ability to acquire, produce and use external knowledge in collaboration with external inventors. Yet, leadership commitment to integration process and innovation transition is examined. For instance, the case study proposed by Kawazoe & Abetti (2014) shows the transition of strategy, R&D and new product development procedures after the acquisition of a small entrepreneurial US hightech company, SuperPower Inc., by Furukawa Electric of Japan. The authors highlight that the integration process, in spite of the cultural differences between Japan and the USA, proceeded successfully, thanks to the leadership of the new Japanese management, the psychological effect of the enhanced mission of SuperPower, the preservation of SuperPower's brand image, the immediate strengthening of production efficiency and quality control procedures. The study by Graebner (2004), however, also emphasizes the role of acquired leaders as active

and essential participants to the post-M&A integration process. By distinguishing between two distinct sources of value, i.e., expected and serendipitous, the authors uncover that expected value is realized when acquired managers preserve their companies' momentum by performing mobilizing and mitigating actions. Serendipitous value, which refers to windfalls that were not anticipated by the buyer prior to the deal (e.g., new strategic ideas, improved product development techniques, and unexpectedly useful technologies), is instead created when acquired personnel take on cross organizational responsibilities that encompass both the acquired and acquiring firms, thanks to which acquired leaders have the visibility to discover unexpected synergies.

2.5. An integrative framework

This section presents findings of the systematic review into a comprehensive framework. The contributions are organized according to a TA model that aims to provide an integrative framework of the acquisition process, divided into *decisionmaking*, *pre-merger phase*, *integration phase* and *outcomes*, while taking contextual factors into consideration. The main dimensions investigated at each stage are thus synthetized and portrayed into a single schematic representation (Fig. 4). The framework starts with the decision-making stage, where determinants of the choice to undertake an acquisition strategy to acquire external technology and the contextual factors related to target screening and selection, as well as contextual factors influencing the effectiveness of the selection process, are shown. The framework subsequently portrays aspects of the integration phase, and finally, acquisition outcomes, grouped into innovation performance and financial performance.

Fig. 4 - An integrative framework of TA research



2.6. Research gaps

The integrative framework provided in this review, synthetizes the current state of TA research. Hence, its primary contribution lies in the analysis of the topic's main dimensions investigated and the subsequent identification of research gaps. Therefore, research opportunities highlighted in the following paragraphs are not intended to be exhaustive, but rather derived, in a holistic manner, from the descriptive analysis and the framework presented.

Gap 1) *Integration of stages*. Most publications focus on the relationship between target-acquirer technological profiles (pre-merger) and innovative performance after acquisition (outcomes). This is not surprising, due to the nature itself of technology-driven M&As. Research on integration-related issues is also extensive. However, few studies (e.g., Chen et al., 2021; Ensign et al., 2014; Wubben et al., 2016) embrace a comprehensive perspective that simultaneously account for target selection and integration-related considerations, in explaining TA outcomes. Nonetheless, to expand the understanding of M&A performance, it is crucial to adopt an integrative perspective that links the specific phases of the M&A process, by studying the connections between pre- and post-merger issues (Bauer *et al.*, 2018). Thus, it is suggested to adopt an integrative approach to the investigation of the relation between antecedents and outcomes, by leveraging on the integration phase.

Gap 2) *Context – process interdependencies*. Environmental and organizational factors related to the acquisition process remain a white spot in many publications. Although recent publications explicitly incorporate some form of context contingency into their research, inconclusive findings disclosed in this review, concerning for instance the impact of TAs on innovation outcomes, might suggest a prevalent lack of extensive consideration of the interaction between the acquisition process and contextual factors. Therefore, more inclusion of time-variant process variables in dynamic modelling, and a greater control for internal and external context is recommended.

- Motive categorization

It is widely recognized that acquisition motives are relevant to understanding acquisition performance (Devos, Kadapakkam and Krishnamurthy, 2009; Rabier, 2017; Aalbers, McCarthy and Heimeriks, 2021). Especially in the context of innovation-driven M&A, it appears of primary importance to properly address the identification of motives behind the operation, to draw reliable conclusions on M&A outcomes. As shown in Table 1, most studies assume that all acquisitions in the high-tech industry, or involving high-tech targets, are technology-driven. Even though high-tech industries are particularly active in acquisitions aimed at accessing the technological expertise of smaller companies – characterized by appropriability regimes that encourage significant patenting activity – a finer categorization of innovative purposes based on disclosed motives besides industry classifications, or on primary data, is suggested for future research, to allow for a more solid understanding of sources of gains in technological acquisitions.

- Acquirer-target technological profiles definition and measurement

From this review, it emerges that different concepts have been applied by scholars to investigate the technological compatibility between acquiring and target firms. Despite successful attempts to enrich the debate on the most suitable target-acquirer combination to achieve improved innovation performance, by using nuanced constructs of technological fit, a fragmented understanding of terms used and measures employed can hamper the development of a consistent corpus of knowledge. In light of this, a summary of variables and metrics used across relevant studies is provided in Table 5. It can be noted that, in most cases, the operationalization of variables is confusing. For instance, technological relatedness has been assessed based on patents overlap (Ahuja & Katila, 2001a; Cloodt et al., 2006; J. Sears & Hoetker, 2014), unique patents in terms of citations (Sears, 2018), subjective appraisal of technological knowledge and capabilities similarity (Cassiman *et al.*, 2005). Hence, besides providing a synthesis of the metrics

employed, the present work stresses the importance for scholars, in future studies, of a consistent use of terminologies and measures drawn from prior research.

- Consistent success metric

One explanation for the various empirical contradictions found across M&A literature involves the underlying performance metrics used (King *et al.*, 2004). This review supports that inconsistency in metrics employed to assess post-M&A outcomes is a big deal in technology-driven acquisitions research. Consistency in construct measurements is needed to avoid misleading conclusions, while the adoption of multiple metrics and of the most suitable indicators based on the study-specific context of analysis, is suggested to allow reconciliation of prior results.

Reference	Variables	Measures
(Wu, Yu and Khan, 2021)	technological similarity	overlap between a focal firm's patents with those of its counterpart regarding their patent classes (averaged values during the preceding 3 years)
(Sedita et al., 2021)	technological similarity/complementarity/unrelatedness	similarity: technological classes of patents acquired present in the acquirer's portfolio at the seven-digit IPC level; complementarity: patent classes detected only in the acquirer's portfolio at the four-digit IPC level; unrelatedness: patents completely new to the portfolio
(Ganzaroli et al., 2016)	technological similarity/complementarity	similarity: patents in the same three-digit sub-classes considering a lag time of one to six years before the M&A complementarity: patents applied for in the same section (one digit), but in different subclasses (three digits), considering a time lag of one to six years preceding the M&A
(Zhou et al., 2018)	technological similarity/complementarity	technological similarity: IPC-based categorical measure approach; complementarity: patents in the same category but in different patent classes
(Lee and Lee, 2022)	technological dissimilarity	Euclidean distance using the number of patents in the same three-digit patent classes in the five years before the M&A
(Shin <i>et al.</i> , 2017)	technological similarity/complementarity	similarity: overlapped patent main-classes, in which both the acquirer firm and the target firm have patents granted during the 5 years prior to the M&A complementarity: non-overlapped target firm's patent main-class, in which only the target firm has patents granted during the 5 years prior to the M&A but resides in the subcategories of the pre-M&A acquirer firm's knowledge base
(Han et al., 2018)	high-quality technological overlap/nonoverlap	average impact, in terms of forward citations, of all the target firm's patents in the overlapped/nonoverlapped patent classes
(Muratova, Rigamonti and Wulff, 2019)	technological uniqueness/ knowledge commonality	uniqueness: number of target unique core technology classes in the 5 years prior to acquisition; common technological knowledge: number of core technology classes that were common to acquirer and target firms in the 5 years prior to acquisition
(Miozzo, DiVito and Desyllas, 2016)	technological similarity/complementarity	similarity: patents applied for by the acquirer and the target that are in the same patent class; complementarity: number of patents in the same category but in different patent classes
(Sears, 2018)	technological overlap	percentage of overlapping knowledge bases, where knowledge base is a count of the number of unique elements of knowledge, i.e., a firm's patent or a patent cited by one of the firm's patents.
(Cloodt, Hagedoorn and Van Kranenburg, 2006a)	technological relatedness	patents that appear in both the acquired and acquiring firm's knowledge base divided by the absolute size of acquired knowledge base
(Cassiman et al., 2005)	technological relatedness	questionnaire: overlapping if R&D projects in the same technological fields and developed capabilities in the same stages of the R&D process; complementary if they are in different technological fields, but one's technological knowledge and know-how could be transferred and combined into the other's R&D activities, or even if they are in the same technological fields but capabilities in different stages of the R&D.
(Testoni, 2022)	technological similarity	text similarity between the patent portfolios of two firms in the year before the acquisition announcement
(J. Sears & Hoetker, 2014)	technological overlap	number of patents in the intersection between acquirer and target knowledge base, calculated as the number of unique patents (firms' patents and patents cited by the firm's patents in the seven years prior to the acquisition announcement date)

(Ahuja & Katila, 2001)	technological relatedness	list of patents numbers that appear in both the acquired and acquiring firm's knowledge base divided by the absolute size of acquired knowledge base
(Makri, Hitt and Lane, 2009a)	technological similarity/complementarity	similarity: patent overlap between the target and acquirer, weighted by the importance of each patent class for the acquirer; complementarity: overlap in patents in the same subcategory but in a different class
(Valentini and Di Guardo, 2012)	technological relatedness	distance of classes of patents received in the five years preceding the deal
(Orsi <i>et al.</i> , 2015)	technological similarity/complementarity	similarity: patents filed in the same four-digit subclasses from one to six years before the M&A complementarity: patents applied for in the same section (one digit) but in different subclasses (four digits) by the partners in the one- to six-year period preceding the M&A
(Hagedoorn and Duysters, 2002b)	technological relatedness	majority of the M&A target's patents falling in related IPC classes
(Chen, Ge and Liu, 2021)	technological similarity/complementarity	similarity: overlap in patent categories of the acquirer and the target within 3 years before the M&A complementarity: overlap in patent sub-categories of the acquirer and the target within 3 years before the M&A
(Phene, Tallman and Almeida, 2012)	technological uniqueness/ knowledge commonality	uniqueness: number of target unique core technology classes in the 5 years prior to acquisition; commonality: number of core technology classes that were common to acquirer and target firms in the 5 years prior to acquisition
(Kapoor and Lim, 2007)	skills overlap	degree of overlap between the granted and cited patents of an acquired firm and those of its acquiring firm, prior to the acquisition

2.7. Conclusions

Given the increasing attention received by innovation-driven acquisitions in industry and academia, this paper has provided a systematic literature review of the technological acquisition research conducted in the management field to date. The review is based on a sample of 97 articles. A synthesis and analysis of contributions' samples, methods, theories, and metrics adopted to operationalize main constructs, are provided. Findings demonstrate the increasing academic interest attracted by the topic in the last years. However, a fragmented state of art with a proliferation of operational definitions and measurements regarding acquisition motives categorization and acquisition performance is observed. From the thematic analysis conducted, three macro areas of research have been identified, namely 1) decisionmaking on TA; 2) target selection; and 3) factors affecting TA success. Based on this, an integrative framework for scholars to further build on and practitioners to be guided by, is developed. Contributions are organized into decision-making, premerger phase, integration phase, and outcomes, while taking into account contingencies. The systematization of studies show that the wealth of knowledge is extensive in some fields (e.g., technological relatedness, similarity, complementarity, and integration), while research following an integrative approach is still scarce. Scholars are, therefore, encouraged to take the integration phase into greater account when studying the relation between antecedents and outcomes. A shortage of research capturing the M&A process dynamism is also observed. Furthermore, a serious reflection on construct measurement is needed. Hence, this review demonstrates that researchers have successfully advanced our understanding of technological acquisitions in the last decades, yet much remains to be done.

Chapter 3 – The Impact of Explorative Versus Exploitative Acquisitions on ESG Performance: An Evidence from European Acquirers

3.1. Introduction

In recent years, sustainability issues, and specifically corporate social responsibility (CSR), have attracted enormous attention from academics, focusing on both antecedents (e.g., Ali et al., 2017; Angus-Leppan et al., 2010; Hahn & Kühnen, 2013; Shafique et al., 2021; Shaukat et al., 2016; Waldman et al., 2006; Zhu & Zhang, 2015) and outcomes (e.g., Brammer & Millington, 2008; Kim et al., 2021; Tang et al., 2012; Wagner & Schaltegger, 2004). Research on the topic keep growing consistently, as companies' commitment to CSR and contribution to sustainable development acquires a prominent role in political agendas, and it is expected to be subject to an ever-greater scrutiny from the banking sector and the financial market in the next years (Barros et al., 2022). This is demonstrated, for instance, by the adoption, in April 2021, of a proposal for a Corporate Sustainability Reporting Directive by the European Commission (2021), which aims to further increase non-financial disclosure requirements. More and more businesses are awarded and opinionized based on their environmental, social and governance (ESG) performance, and rating agencies' ESG scores are booming as evaluation tools for investors to make sustainable decisions (Buallay, 2019; Drempetic, Klein and Zwergel, 2020).

Accordingly, ESG is reshaping the merger and acquisition (M&A) landscape. Firms engaging in M&A deals show growing concerns for their ESG scores, which is reflected in deal motives – as testified, for example, by the sustainability-driven acquisition of Ben & Jerry's by Unilever – and M&A assessments (Deloitte, 2021). As a consequence, the topic of M&A and sustainability has triggered academic research in management and finance in recent times (González-Torres et al., 2020). A more substantial group of studies has focused on the impact of CSR on deal characteristics, such as deal probability (Berchicci, Dowell and King, 2012; Gomes, 2019; Boone and Uysal, 2020a), bid premiums (Gomes and Marsat, 2018; Ozdemir,

Binesh and Erkmen, 2021), deal completion (Deng, Kang and Low, 2013; Hawn, 2021) and duration (Hawn, 2021), and its effect on post-acquisition performance, mostly in terms of stock market reactions to acquisition announcements (Aktas, de Bodt and Cousin, 2011; Deng, Kang and Low, 2013; Arouri, Gomes and Pukthuanthong, 2019; Krishnamurti et al., 2019b; Caiazza, Galloppo and Paimanova, 2021) and firm market value (Tampakoudis and Anagnostopoulou, 2020b; Teti, Dell'Acqua and Bonsi, 2022). Another stream of research, instead, has started to address sustainability outcomes of M&A deals (Tampakoudis and Anagnostopoulou, 2020b; Vastola and Russo, 2021; Barros et al., 2022), as the link between CSR and M&A is not a one-way process but bidirectional (Barros et al., 2022). In this regard, studies provide evidence that acquirers' ESG performance increases as a result of M&A deals, thus suggesting that mergers and acquisitions can be regarded as important drivers for sustainability performance (Tampakoudis and Anagnostopoulou, 2020b; Barros et al., 2022). However, such studies neglect the motives behind acquisitions, inferring the presence of CSR-oriented reasons from target characteristics (Tampakoudis and Anagnostopoulou, 2020b) or sustainability outcomes (Barros et al., 2022), thus not considering the main intended objectives of the acquisition. Even though an increasing number of deals driven by sustainability or responsibility motives has been witnessing (Meglio, 2020), global survey data also point out that firms are struggling to extensively assess ESG during the deal-making process, and that ESG is still the least-emphasized dimension by executives in corporate M&A process, compared to traditional economic/financial aspects (Bain & Company, 2022). The importance of motives in explaining acquisition performance – in terms of stock market reactions (Aalbers et al., 2021), operating performance (Devos, Kadapakkam and Krishnamurthy, 2009) and innovative outputs (Ahuja and Katila, 2001b; Cloodt, Hagedoorn and Van Kranenburg, 2006b; Makri, Hitt and Lane, 2009b) - has been extensively supported in finance and strategy research (Rumelt, 1982; Chatterjee, 1986; Seth, 1990; Capron, 1999; Ahuja and Katila, 2001b; Aalbers, McCarthy and Heimeriks, 2021). Therefore, it is fundamental to consider the specific purposes underlying M&A transactions, an aspect that has been greatly overlooked by prior research investigating the link between M&As and sustainability. The question 'what is the

impact of mergers and acquisitions on sustainability performance?" is undoubtedly intriguing for M&A research and practice, thus deserving further investigation. Going beyond traditional financial performance measurements to establish the impact of acquisitions using non-financial performance metrics meets the call for "replacing the narrow, shareholder-centric view with the broader stakeholderdriven view of acquisitions", reported in recent literature (Meglio, 2020, p. 6). M&A process, indeed, are complex events involving multiple stakes, able to produce consequences not only at individual and organizational, but also at societal level (Meglio, 2020). Notwithstanding, acquisition research has only marginally addressed sustainability issues.

In this study, therefore, I distinguish between different acquisition announced motives, to test the ability of M&A deals to promote ESG performance after acquisition in the long term. Specifically, I employ March (1991)'s explorationexploitation framework, which has been previously adopted for categorizing acquisitions (Angwin, 2007), to conduct the analysis. While the concept of 'exploration' is associated with "search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation" (March, 1991, p. 71), 'exploitation' entails "refinement, choice, production, efficiency, selection, implementation, execution" (March, 1991, p. 71). Compared to categorizations based on industry relatedness, which may prove to be an incomplete criterion to capture the nature of the acquisition (Rabier, 2017), this classification takes into account a comprehensive pattern of disclosed motives (Aalbers, McCarthy and Heimeriks, 2021). Thomson Reuters ESG Scores, as a measure intensively used in prior academic research (e.g., Barros et al., 2022; Demers et al., 2021; Dicuonzo et al., 2022; Tampakoudis & Anagnostopoulou, 2020), are utilized to quantify ESG performance in the three years following deal completion (Hagendorff and Keasey, 2009; Caiazza, Galloppo and Paimanova, 2021). Data are collected over a sample of deals completed by acquirers located in Europe along the period 2010-2018. Undoubtedly, Europe represents an interesting context of analysis, due to the crucial role played by the European Union (UE) in driving sustainable change. Its fierce and strong commitment dates back to the Lisbon European Council held in 2000, where the UE set the strategic goal "to become the most competitive and dynamic

knowledge-based economy in the world, capable of sustained economic growth with more and better jobs and greater social cohesion" (Presidency Conclusions, Lisbon European Council, 23 and 24 March 2000). Over the past 20 years, several interventions have occurred, including the enactment of the Directive 95/2014/UE, conceived as a means to support the diffusion, consistency and comparability of corporate non-financial information across UE countries. The results of my analysis support that exploration- and exploitation-oriented acquisitions exert a different impact on the acquiring firm's ESG performance post-M&A. Indeed, explorative acquisitions are found to produce a notable positive impact on ESG scores in the three years following acquisition, whilst exploitative acquisitions show a negative association. By looking at the impact of M&A deals on individual ESG pillars, it emerges that, in both cases, governance is the most impacted dimension in the year following deal closing. While the positive impact of a CSR-oriented governance manifests in the enhancement of the environmental pillar in explorative acquisitions, in exploitative-driven deals the social dimension is the one that suffers the most from reduced CSR management commitment.

The study makes a number of contributions. First, I contribute to the emerging literature investigating ESG attributes in the M&A context (Aktas, de Bodt and Cousin, 2011; Gomes and Marsat, 2018; Boone and Uysal, 2020a), where very little research has been conducted on the impact of M&A deals on sustainability (Meglio, 2020; Gillan, Koch and Starks, 2021). Since prior evidence support a beneficial effect of M&A activity on ESG practices (Barros et al., 2022), I enrich the current level of understanding by providing evidence of the different outcome, in terms of ESG commitment, stemming from two competing types of acquisitions. Second, the study brings a contribution to acquisition research embracing a stakeholder perspective (Meglio & Park, 2019), by addressing M&A implications for ESG performance in the post-merger phase. Third, I contribute to the literature on acquisition motives by building upon discussions on M&A motives in finance (e.g., Devos et al., 2009) and strategy (e.g., Aalbers et al., 2021; Rabier, 2017), and extending the debate to consider the impact of acquisitions motivated by different strategic intentions on the ESG performance in the years following the completion of the deal. In doing so, I answer to the call for further research on the relationship

between the announced motive and the acquirer's long-term performance (Aalbers et al., 2021). Fourth, the study's findings bring a contribution to the CSR literature, expanding the literature on drivers of ESG practices (e.g., Waldman, Siegel and Javidan, 2006; Angus-Leppan, Metcalf and Benn, 2010; Hahn and Kühnen, 2013; Moratis and Tatang Widjaja, 2014; Zhu and Zhang, 2015; Ali, Frynas and Mahmood, 2017; Shafique, Kalyar and Mehwish, 2021).

The reminder of the paper is organized as follows. In section 3.2 the research background is presented and hypotheses are developed. Section 3.3 describes the methodology followed to conduct the research. Section 3.4 shows empirical results of the analyses. Finally, in section 3.5., the results are discussed, and the theoretical and practical implications of the study, as well as limitations and future research avenues, are presented.

3.2. Research background and hypothesis

Sustainability perspectives in acquisition research

Acquisitions are popular strategic choices that enable companies to simultaneously achieve multiple aims, such as realizing cost and revenue-synergies, increasing market power, avoiding innovation stifling (Angwin, 2007). As a field of research, acquisitions have attracted great attention from scholars in different disciplines over the past decades (Nahavandi and Malekzadeh, 1994), mobilizing a multitude of theoretical lenses (Bauer and Matzler, 2014) to capture the complexity and multifaceted nature of the phenomenon (Dao and Bauer, 2021). Scholars have addressed the strategic and organizational implication of acquisitions, resulting in a wide array of integration models and variables influencing the post-merger phase (Angwin and Meadows, 2015). Further, to the extent that M&As are traumatic events, able to produce strongly negative consequences on individuals (Schweiger, Ivancevich and Power, 1987), over time, human-related factors have gained greater consideration in the M&A debate (King et al., 2020b; Dao and Bauer, 2021). Thus, prior research signals that a multitude of consequences stems from M&A operations, involving different stakeholders (González-Torres et al., 2020) and occurring over different time horizons (Meglio, 2020). However, M&A literature has traditionally adopted a theory of the firm that assigns primacy to the interests of shareholders over those of other stakeholders (Bettinazzi and Zollo, 2017). Particularly, recent contributions emphasize (Meglio and Park, 2019) that acquisition research has, for the most part, focused on M&A mechanisms of value creation and destruction in economic and financial terms, while other dimensions of value, such environmental or societal, have been largely neglected. Thus, despite recognizing the complexity and multidimensionality of the acquisition performance construct (King et al., 2004), entailing consequences that manifest over time in the context of a dynamic process (Dao and Bauer, 2021), studies have mainly measured acquisition performance in the short-term by means of stock market reactions (Meglio and Risberg, 2011). This is based on the assumption that markets are efficient and transparent (Fama, 1970), and therefore able to predict, at the time of the announcement, whether a deal will create or destroy value. The use of this methodology has been challenged by prior work (Papadakis and Thanos, 2010), showing that cumulative abnormal returns are not correlated to either accounting-based measures or managers' subjective assessments. A recent bibliographic study on sustainability research in M&A highlights that research on performance measurement is going beyond traditional financial indicators, by integrating the three pillars of sustainability (González-Torres et al., 2020). This research direction can enable a deeper understanding of the generative mechanisms that lead to acquisition performance, and allow to account for the new stakeholder responsibilities faced by companies in today's business world. Thus, an evolution from a shareholder-centric to a broader stakeholder perspective is emerging (Meglio, 2020), even though still in its infancy (González-Torres et al., 2020).

Acquisition motives and outcomes

Linking acquisition motives to post-acquisition performance has been of central interest in strategy and finance research for decades (Seth, 1990; Walter and Barney, 1990; King *et al.*, 2004). Authors acknowledge that the value stemming from acquisitions can be generated in a variety of ways (Rabier, 2017), through efficiency gains from economies of scale and scope (Chatterjee, 1986; Seth, 1990; Walter and Barney, 1990), revenue-enhancements from internal innovation (Ahuja

and Katila, 2001b), purchase of external innovation (Hitt et al., 1996), financerelated benefits (Chatterjee, 1986). Prior literature, indeed, has largely provided evidence of the importance of motives in explaining acquisition performance. For instance, Devos et al. (2009) found that acquisitions motivated by operating synergies (e.g., revenue growth through new product offerings or cost savings through economies of scale) experience greater gains than those driven by financial synergies (e.g., diversification of cash flow streams), but also higher negative longterm returns (Rabier, 2017). Regarding innovation-motivated acquisitions, it is supported that, while non-technological acquisitions appear to have a negative impact on the acquiring firm's post-M&A innovative performance (Ahuja and Katila, 2001b; Cloodt, Hagedoorn and Van Kranenburg, 2006b), technological acquisitions can foster innovative outcomes, contingent on several factors (e.g., Ahuja and Katila, 2001; Cloodt, Hagedoorn and Van Kranenburg, 2006; Makri et al., 2009). Scholars have also recognized that exploration- and exploitation-oriented acquisitions have differing impacts on acquisition performance, both in the shortterm (Zhang, Lyles and Wu, 2020; Aalbers, McCarthy and Heimeriks, 2021) and in the long run (Lange and Wagner, 2021). Indeed, these studies suggest that the market responds more positively to the announcement of acquisitions with pure exploitative motives, which are interpreted as less risky signals (Aalbers, McCarthy and Heimeriks, 2021), than to pure explorative acquisitions (Zhang, Lyles and Wu, 2020). Further, by looking at the impact on the post-M&A innovative performance, Lange and Wagner (2021) support the existence of a saturating relationship of exploratory acquisitions and exploratory innovation output, while they find an inverted U-shaped association between the exploitation orientation of acquisitions and exploitative innovation output.

Acquisition motives can be categorized in a number of ways. Traditionally, the finance literature emphasizes the distinction between acquisition motives related to 'operating synergies' (i.e., gains achieved through the combination of the acquirer's and target's resources, such as revenue growth through new product offerings or cost savings through economies of scale), acquisition motives related to 'financial synergies' (i.e., gains achieved through the combination of the acquirer's and target's financial structure, including tax savings, lower cost of capital,

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diversification of cash flow streams, and extraction of gains from well-managed but undervalued targets), and 'collusive synergies' deriving from the market power generated by the merger (Devos, Kadapakkam and Krishnamurthy, 2009). Different measures and proxy for acquisition motives are shown across the literature, to account for acquisition motives (Aalbers, McCarthy and Heimeriks, 2021). Indeed, while some studies build upon declared motives (Krishnan, Hitt and Park, 2007; Rabier, 2017) disclosed in conference calls or press releases, others derive motives from the acquisition outcomes, namely the different type of synergies realized (Houston, James and Ryngaert, 2001; Devos, Kadapakkam and Krishnamurthy, 2009) or the target's industry or type, as in the case of 'technological acquisitions' (Cloodt, Hagedoorn and Van Kranenburg, 2006b; Valentini, 2016; Cefis, Marsili and Rigamonti, 2020b). Drawing upon March's (1991) exploration-exploitation framework, Angwin (2007) distinguishes between explorative and exploitative acquisitions. He suggests that the former are driven by the company's desire to expand into new products and services, new industries and new geographic regions, learning to create new products, services and markets, or accelerating innovation by accessing intellectual property, patents, knowledge or technology that enable the firm to change its current technological trajectory. The latter, instead, are motivated by improving the firm's current financial position, reducing tax exposure, building economies of scale and scope, cutting costs, or vertically integrating to improve supply chains, strengthening the core business, building size.

Exploration-/exploitation-oriented acquisition and ESG performance

The adoption of an explorative orientation allows learning different ways of doing things, increasing the variety of events and ideas to which the firm is exposed, thus leading to a more extensive knowledge base and stronger innovative capabilities (Luo and Peng, 1999). I assume that a departure from the firm's old certainties is beneficial for the acquiring firm's sustainability performance. Indeed, the achievement of ESG goals is inextricably linked to innovation (Bansal, 2002; Kuzma et al., 2020). Innovation, in the form of R&D investments and patent production, has been demonstrated to have a positive impact on ESG practices (Sempere-Ripoll *et al.*, 2020; Dicuonzo *et al.*, 2022). Innovation can be leveraged

to make more informed decisions based on non-financial metrics, to improve stakeholder engagement and sustainable reporting practices, and to address corporate social responsibility, accountability and transparency (Lombardi and Secundo, 2021). A specific form of innovation that considers environmental and social concerns is sustainable innovation, which refers to innovation that brings economic, ecological, and social benefits, contributing to the concept of the triple bottom line (Yoon and Tello, 2009). Exploration allows firms to seek new knowledge, opportunities, technologies, and resources to build sustained inimitable competences. This is achieved through a unique configuration of newly captured firms' resources and capabilities with the existing ones, and, as a consequence, to achieve breakthrough changes in processes and products (Shafique, Kalyar and Mehwish, 2021). Prior studies have linked innovation capability from external sources of knowledge, such as R&D cooperation, to the propensity of introducing green innovation, thereby proposing a substitution effect with internal R&D efforts (De Marchi, 2012). Exploration-oriented acquisitions can be regarded as a means to gain access to knowledge that is largely unrelated to the organization's familiar cognitive setting (Lange and Wagner, 2021), thus promoting experimentation, facilitating learning beyond the current knowledge boundaries (Luo and Peng, 1999) and exerting, up to a certain degree, a positive influence on exploratory innovation output (Lange and Wagner, 2021). In this light, I propose explorative acquisitions to be an engine of sustainable innovation, leading to enhanced ESG performance. Furthermore, CSR involves strongly considering stakeholders' demands and needs, which requires the ability to identify and innovate evolving strategic opportunities and challenges. Stakeholder engagement represents one of the three main institutional elements (besides operational processes and organizational culture) that drives, enables, and embeds corporate social innovation (Herrera, 2015). It poses significant challenges to an organization, due to the difficulties in managing often differing and competing interests stemming from multiple stakeholder groups. In this regard, exploration can foster the firm's ability to handle new opportunities and face challenges. This capability is weaker in firms that deal with relatively few products, markets, and customers, since they have

narrower mental models, due to the more limited range of challenges they face (Lange and Wagner, 2021). Therefore, I propose the following:

Hp1. Exploration-oriented acquisitions are positively associated with the acquiring firms' post-M&A ESG performance.

Through exploitation, firms aim to refine and improve their existing knowledge, competences, and practices, achieve greater efficiency, and develop incremental innovation (Atuahene-Gima, 2005). This can lead to a more efficient use of resources and to the improvement of business processes and products towards sustainability and eco-friendliness (Shafique, Kalyar and Mehwish, 2021). However, I hold that while strengthening existing operations does not necessarily entail a progress towards higher levels of responsible usage of resources, some of the implications of exploitative-oriented M&As can negatively affect the acquiring firm's ESG performance. Indeed, in exploitative acquisitions, the achievement of operating synergies is a primary focus in the integration process, mainly pursued through cutbacks in investments (Devos, Kadapakkam and Krishnamurthy, 2009). Expenditure reductions are likely to fall upon CSR voluntary programs, including workforce support through the provision of training and development opportunities to employees, engagement in community-related initiatives, or sustainability reporting practices. Other considerations relate to the 'human side' of the transaction, since the realization of operating synergies generally results in a number of job shifting and/or workforce reductions, in order to eliminate redundancies and thereby extract economies of scale (Conyon et al., 2002; Krishnan, Hitt and Park, 2007). Compared to 'complementarity' acquisition motives, 'efficiency' motivated acquisitions are more likely subject to duplication in value chain functions, and hence acquirers are more likely to reduce their workforce (Krishnan, Hitt and Park, 2007). Downsizing and pressures put on (fewer) employees for productivity improvements, readily result in worsen morale (Smith, 2005), which is turn associated with reduced innovation (Shanker et al., 2017). Integration concerns on market consolidation and cost efficiencies, can also

conceivably result in a reduced attention to environmental management (Waddock and Graves, 2006). Therefore, I test the following hypothesis of research:

Hp2. Exploitation-oriented acquisitions are negatively associated with the acquiring firms' post-M&A ESG performance.

3.3. Methodology

3.3.1 Sample selection and data collection

I leverage Thomson Financial Securities Data Company (SDC) database to build my sample. I initially search for M&A deals completed between January 2010 and December 2018, in order to account for a significant span of time and to be able to evaluate the effects on ESG performance in the three years following deal completion, thus, for instance, in fiscal years 2019, 2020 and 2021 (the latest year with ESG data available) for deals completed in fiscal year 2018. Subsequently, I filter the deals obtained according to the following criteria. First, both the bidder and the target firms are public companies, which allows for the availability of ESG information publicly disclosed by companies. Then, I include only deals whose value is equal or greater than \$1 million, to exclude very small transactions (Tampakoudis and Anagnostopoulou, 2020b). I further restrict the sample to deals where the bidder seeks to acquire more than 50% of the target's voting stock (Deng, Kang and Low, 2013; Huang, Officer and Powell, 2016) and exclude transactions consisting in exchange offers, LBOs, privatizations, recapitalizations, spin-offs, self-tender offers, repurchases, partial stock-stake purchases, and acquisitions of remaining interest (Huang, Officer and Powell, 2016). I focus on acquiring firms with their headquarters located in Europe, while no restrictions are imposed on a target's country of origin. Finally, I exclude cases where the acquiring or the target firm pertains to the financial industry. Subsequently, I filter companies based on the availability of ESG and financial data on Thomson Reuters ASSET 4 and Refinitiv Eikon databases, respectively. The sample is thus limited to deals where ESG scores of the acquiring firms are available for the fiscal year prior to the announcement date and for the three fiscal years following deal completion date, as

well as financial data relevant to the study for the fiscal year prior to that of measurement of ESG performance. This leads me to a sample of 515 deals. I drop repeated observations in the same year (firms that carried out more than one acquisition in the same year) and across the three years (firms that carried out, for instance, acquisitions in two subsequent years), in order to isolate the effect of a deal in the subsequent three years. Consequently, I end up with a final sample of 300 observations. Table 6 presents the number of observations per year, while the European countries and industries involved in the sample appear in Table 7 and Table 8, respectively.

Year	#Deals	Proportion (%)
2010	53	17.67
2011	67	22.33
2012	38	12.67
2013	24	8.00
2014	32	10.67
2015	30	10.00
2016	24	8.00
2017	15	5.00
2018	17	5.67
Total	300	100.00

Table 6 - Sample distribution by year of announcement

This table provides the sample distribution by announcement year. #Deal denotes the number of deals per year.

Nation	#Acquirers	Proportion (%)
United Kingdom	96	32.00
France	37	12.33
Germany	26	8.67
Switzerland	25	8.33
Netherlands	12	4.00
Russia	12	4.00
Sweden	12	4.00
Ireland	11	3.67
Spain	11	3.67
Italy	10	3.33
Finland	8	2.67
Norway	8	2.67
Poland	6	2.00
Austria	5	1.67
Belgium	4	1.33
Denmark	4	1.33
Luxembourg	4	1.33
Others	9	2.98
Total	300	100

Table 7 - Sample distribution by country

This table provides the sample distribution by acquirer's country. #Acquirers denotes the number of acquirers per country.

Industry	#Acquirers	Proportion (%)
Consumer Products and Services	30	10.00
Consumer Staples	25	8.33
Energy and Power	41	13.67
Healthcare	26	8.67
High Technology	22	7.33
Industrials	54	18.00
Materials	41	13.67
Media and Entertainment	26	8.67
Retail	16	5.33
Telecommunications	19	6.33
Total	300	100.00

Table 8 - Sample distribution by industry

This table provides the sample distribution by acquirer's industry, based on TRBC macro-industry classification. #Acquirers denotes the number of acquirers per industry.

Dependent variable

In line with previous studies (Drempetic, Klein and Zwergel, 2020; Battisti et al., 2022; Dicuonzo et al., 2022), I use Refinitiv's ESG performance data (ESG score) as the dependent variable. The ESG score is the result of three sub-scores related to the ESG areas. The categories that make up the environment pillar (ENV) are as follows: resource use, which refers to the company's ability to reduce the use of resources, such as materials, water or energy, and to identify eco-efficient solutions for the production of products; emission reduction; and innovation, which refers to the company's ability to adopt technological solutions to reduce environmental costs and create new market prospects. In terms of social aspects (SOC), the following are considered: the focus on the workforce (i.e. the ability of the company to create satisfaction for its employees, maintain gender diversity and ensure equal opportunities for all); the focus on human rights; the protection of community aspects, measured by the company's involvement in the protection of public health and respect for business ethics; and *product responsibility*, which reflects the ability of a company to produce goods or provide services that integrate customer health, safety, integrity and privacy. Finally, with regard to screening in terms of corporate governance (GOV), the following are considered: the skills of management; shareholder protection in terms of the company's ability to ensure fair treatment for shareholders; and *corporate social responsibility* strategies in terms of the company's ability to integrate economic, financial, social and environmental dimensions into business management.

Independent variable

For the categorization of acquisition motives, I follow prior work by Aalbers et al. (2021), who drew upon Angwin's (2007) motive archetypes, to classify acquisitions consistently March's (1991) exploration-exploitation framework. with Accordingly, I categorize motives as follows: explorative acquisitions as M&A operations driven by technological, expansionary and learning purposes, and exploitative acquisitions as motivated by *financial*, *economic*, *strategic* or *market* share considerations. A more detailed description of categories is provided in Table 9. Data on acquisitions motives are collected from SDC database, which reports purposes for each transaction. The information provided is retrieved from press releases for the announcement or completion of the deal, and they read like this "the purposes of the transaction were for Shanks Group PLC to strengthen its operations by creating synergies and expand its presence in new markets". In cases where the purpose/s is/are less easy to be categorized, I search for additional information on the web by looking more in detail to CEO's declarations reported on newspapers. Thus, I create the independent variables as follows: explor dummy, a dummy variable coded 1 if the acquisition is motivated exclusively by reasons pertaining to the category 'exploration', and 0 otherwise; exploit dummy, a dummy variable coded 1 if the acquisition is motivated exclusively by reasons pertaining to the category 'exploitation', and 0 otherwise.

Control variables

I include control variables drawn from prior CSR research that could have an impact on my dependent variable. I control for the acquirer's *size*, measured as the natural logarithm of total assets (Nirino, Miglietta and Salvi, 2019). Indeed, larger firms are expected to show higher ESG scores as they are more concerned about reputational risks, and their scale allows them to afford CSR investments that otherwise could be damaging for firm performance (Barros *et al.*, 2022). I include *profitability*, as measured by return on equity (ROE) (Barros *et al.*, 2022), since financially healthy companies are more likely to invest in CSR strategies (Mittal, Sinha and Singh, 2008); *leverage*, calculated as the ratio of total debt on total assets, as the higher the firm's leverage, the greater the attention devoted by mangers to creditors at the expense of other stakeholders (Surroca, Tribó and Waddock, 2010); *tangibility*, which captures the firm's capital intensity and is computed as the net value of property, plant, and equipment scaled by total assets (Barros *et al.*, 2022; Battisti *et al.*, 2022); and *R&D expenses*, as a proxy for firm's propensity to innovate, measured as the ratio of R&D expenses over total sales (Battisti *et al.*, 2022), since innovation is found to be positively related to ESG performance (Dicuonzo *et al.*, 2022). Due to several missing values in data related to R&D expenses, I treat missing values as being 0 and added a dummy variable (R&D_miss) coded 1 if the value is missing, and 0 otherwise (Uotila *et al.*, 2009). Finally, I control for *year dummies*, since there are multiple years involved in the study, I code all nine years into dummy variables to control for yearly fluctuations.

3.3.2. Descriptive statistics

Table 10 reports that 155 acquisitions (52%) in the sample relate to purely 'exploitative' motives, in 54 acquisitions (18%) acquirers announce purely 'explorative' motives, while for 91 acquisitions (30%) the announced motive include both explorative and exploitative rationales, thus showing an ambidextrous set of motives. In Table 11, summary statistics for all variables used are presented. The average acquiring firms' ESG score in the year following the deal closing is 55.73 with a standard deviation (SD) of 20,03%, in line with previous research (DasGupta, 2021; Gomes & Marsat, 2018). Table 12 shows the Pearson correlation matrix. Weak correlations (r < .30) are observed between independent variables, which support that multicollinearity is not an issue.

Motive category	Motive sub- category	Description
Explorative	Technological	To get access to intellectual properties, patents and technological knowledge
	Expansionary	To expand into new/foreign markets or geographical regions, to extend product markets or industries, to expand the product range
	Learning	To create, accelerate, develop new products or markets
Exploitative	Financial	To improve financial position, to reduce financing costs, risk, tax exposure, to achieve immediate financial gains
	Economic	To build economies of scale or scope, to cut costs of operations, to vertically integrate, to increase market power, to strengthen the core business
	Strategic	To improve access to distribution, to acquire valuable and unique assets (physical resources), to change industry dynamics, to become industry leader
	Market share	To build size, to strengthen market presence, to gain critical mass

Table 9 - Acquisition motives

Table 10 - Announced motives

Type of acquisition	#Deals	Proportion (%)
Exploitative	155	51.67
Explorative	54	18.00
Ambidextrous	91	30.33
Total	300	100.00

This table provides the sample distribution by acquirer's industry, based on TRBC macro-industry classification. #Acquirers denotes the number of acquirers per industry.

	Mean	SD	Min	Max
ESG	55.733	20.027	6.613	91.615
explor dummy	0.180	0.385	0.00	1.00
exploit dummy	0.517	0.501	0.00	1.00
size	8.858	1.563	5.393	12.729
ROE	4.131	0.441	354	7.261
leverage	2.905	0.886	0.00	4.395
tangibles	3.641	0.594	-1.181	5.199
RD/sales	2.322	5.15	0.00	46.771
RD_miss	0.487	0.501	0.00	1.00

Table 11 - Summary statistics

This table reports the mean, median, standard deviation, minimum, maximum of variables used in the sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) ESG	1								
(2) explor_dummy	0.104	1							
(3) exploit_dummy	-0.168	-0.484	1						
(4) size	0.633	0.051	-0.048	1					
(5) ROE	-0.107	0.008	0.028	-0.199	1				
(6) leverage	0.182	0.058	-0.060	0.291	-0.007	1			
(7) tangibles	-0.029	0.022	0.149	0.195	-0.052	0.216	1		
(8) RD/sales	0.040	-0.025	-0.107	-0.029	0.059	-0.164	-0.186	1	
(9) RD_miss	-0.249	-0.022	0.168	-0.154	-0.002	0.064	0.095	-0.440	1

Table 12 - Correlation matrix

This table reports Pearson corelation matrix.

3.3.2. Multivariate analysis

I adopt ordinary least squares (OLS) regression models to analyze my data, with robust standard errors to account for heteroskedasticity. Thus, I test hypotheses by using ESG scores related to the three fiscal years following the deal completion date (T+1, T+2 and T+3) as dependent variables, and two dummies *explor_dummy* and *exploit_dummy* as independent variables, while controlling for year dummy variables, firm size, return on assets, leverage, tangible assets, and R&D expenses. To examine the effect of these variables, financial data used as controls refer to the year preceding that of measurement of the dependent variable, thus addressing endogeneity issues. Therefore, to study the log-term effects of announced M&A, I estimate the following regression models:

$$ESG_{(t+k)i} = \beta_0 + \beta_1 explor_dummy_i + \beta_j \sum controls_{(t+k-1)i} + \lambda_t + \varepsilon_i \quad (Model 1)$$
$$ESG_{(t+k)i} = \beta_0 + \beta_1 exploit \quad dummy_i + \beta_j \sum controls_{(t+k-1)i} + \lambda_t + \varepsilon_i \quad (Model 2)$$

with k=1,2,3, where \sum controls_i is a vector of control variables reported in section 3.3.1., λ_t indicates dummies for year of announcement, which I include to control omitted factors that can affect our dependent variables, and ε_i is the error term.

Then, in line with other studies (Barros *et al.*, 2022), I deconstruct the ESG score (the primary dependent variable) into each of its three pillars (environmental, social, and governance), to capture different perspectives on the impact of M&As:

$$\begin{split} & \text{ENV}_{(t+k)i} = \beta_0 + \beta_1 \text{explor}_d \text{ummy}_i + \beta_j \sum \text{controls}_{(t+k-1)i} + \lambda_t + \epsilon_i \quad (\text{Model 3}) \\ & \text{SOC}_{(t+k)i} = \beta_0 + \beta_1 \text{explor}_d \text{ummy}_i + \beta_j \sum \text{controls}_{(t+k-1)i} + \lambda_t + \epsilon_i \quad (\text{Model 4}) \\ & \text{GOV}_{(t+k)i} = \beta_0 + \beta_1 \text{explor}_d \text{ummy}_i + \beta_j \sum \text{controls}_{(t+k-1)i} + \lambda_t + \epsilon_i \quad (\text{Model 5}) \end{split}$$

ENV
$$_{(t+k)i} = \beta_0 + \beta_1 \text{exploit dummy}_i + \beta_j \sum \text{controls}_{(t+k-1)i} + \lambda_t + \varepsilon_i \text{ (Model 6)}$$

SOC
$$_{(t+k)i} = \beta_0 + \beta_1 exploit_dummy_i + \beta_j \sum controls_{(t+k-1)i} + \lambda_t + \varepsilon_i$$
 (Model 7)

$$GOV_{(t+k)i} = \beta_0 + \beta_1 exploit_dummy_i + \beta_j \sum controls_{(t+k-1)i} + \lambda_t + \varepsilon_i \quad (Model 8)$$

with k=1,2,3.

3.4. Empirical results

The regression analysis results for Model 1 and 2 are presented in Table 13 and Table 14, respectively. Models show a good fit, with R² values comprised between 0.45 and 0.50. Results reveal that the relationship between explorative acquisitions and ESG performance is positive and statistically significant, in all three years subsequent to deal completion (β = 5.85, p < .001), (β = 5.84, p < .001), (β = 4.81, p < .05) (Table 13). These results support hp. 1), where explorative motives are assumed to have a positive impact on ESG scores in the long-term. Thus, there is evidence supporting that carrying out this type of deals enhances a firm ESG performance from the first year after acquisition. In Model 2, the relationship between exploitative acquisitions and ESG performance is tested. Results indicate that there is a negative and statistically significant association between the exploration-oriented nature of acquisitions and ESG scores in all three years subsequent to the completion of the deal (β = -3.84, p < .05), (β = -4.30, p < .05), $(\beta = -4.45, p < .05)$ (Table 14), thus supporting hp. 2). These findings challenge prior evidence of a positive association between M&A activity and ESG scores tout-court (Barros et al., 2022), by suggesting that drawing a distinction between

the explorative and exploitative nature of the acquisition deepens our understanding on the risks that certain channels entails for sustained value creation in M&As. Further, the separate analysis of each pillar adds information to better comprehend these causal effects. Explorative acquisitions are positively related to the governance score in year (T+1) and year (T+2) (β = 8.21, p < .05) (β = 8.87, p < .001) (Table 17), while a slightly significant positive effect is observed for the social pillar in the same years (β = 5.11, p < .1) (β = 4.79, p < .1) (Table 16). Regarding the environmental score, no significant effect is observed in the first two years after deal completion, while a positive and significant association is found in year (T+3) $(\beta = 5.55, p < .05)$ (Table 15). Thus, findings suggest that pure explorative acquisitions are beneficial for the implementation of corporate social responsibility policies and practices, which in turn result in the realization of green innovations and reductions in environmental impacts. Considering the impact of exploitative acquisitions, instead, it is shown that the governance score is negatively impacted only in year (T+1) and year (T+2) (β = -5.64, p < .05) (β = -5.44, p < .05) (Table 20); the social pillar is negatively affected in all three years, even though only a slight significance is exhibited in the first year after deal closing (β = -3.88, p < .1) $(\beta = -4.51, p < .05)$ ($\beta = -5.23, p < .05$) (Table 19); yet, some empirical evidence supports a negative effect on the environmental score in the third year following deal completion (β = -4.11, p < .1) (Table 18). Conversely to the case above, therefore, pure exploitative acquisitions are detrimental for management engagement in CSR practices, weighing especially on reduced commitment toward employees, communities and customers in the following years. The statistical significance of the governance score in the year following deal completion in Model 5 and Model 8, supports the theoretical and methodological separation, suggested by previous studies (Nirino, Miglietta and Salvi, 2019; Battisti et al., 2022), among the governance pillar, which affect management decisions on CSR investments, and the social and environmental pillars, as outcome measures of such strategies.

	$ESG_{(t+1)}$	ESG _(t+2)	ESG _(t+3)
explor_dummy	5.853***	5.841***	4.807**
	(2.204)	(2.204)	(2.113)
Size	8.127***	7.879***	7.573***
	(0.528)	(0.567)	(0.561)
ln_ROE	1.806	-0.452	0.284
_	(1.472)	(0.455)	(1.014)
ln_leverage	0.182	-2.951**	-1.714**
	(1.061)	(1.283)	(0.801)
ln_tangibles	-5.212***	-4.133*	0.115
	(1.287)	(2.199)	(1.193)
RD/sales	-0.082	-0.065	-0.067
	(0.138)	(0.145)	(0.138)
RD_miss	-6.152***	-6.601***	-6.861***
	(1.901)	(1.915)	(1.840)
constant	-6.016	15.238	-8.438
	(8.916)	(10.749)	(6.783)
observations	300	297	295
R-squared	0.493	0.470	0.459
year FE	YES	YES	YES

Table 13 - Results of regression analysis: Model 1

*** p<0.01, ** p<0.05, * p<0.1

The table shows the results of regression analysis. Model 1: $ESG_{(t+1)}$ as dependent variable. Model 2: $ESG_{(t+2)}$ as dependent variable. Model 3: $ESG_{(t+3)}$ as dependent variable.

Independent variables	$ESG_{(t+1)}$	ESG _(t+2)	ESG _(t+3)
exploit_dummy	-3.835**	-4.299**	-4.446***
	(1.716)	(1.713)	(1.675)
Size	8.122***	7.849***	7.550***
	(0.531)	(0.569)	(0.554)
ln_ROE	1.841	-0.229	0.860
	(1.501)	(0.471)	(0.955)
ln_leverage	0.136	-2.393*	-1.381*
	(1.051)	(1.302)	(0.822)
ln_tangibles	-4.679***	-4.373**	0.123
	(1.283)	(2.216)	(1.222)
RD/sales	-0.110	-0.098	-0.085
	(0.131)	(0.140)	(0.130)
RD_miss	-5.798***	-6.225***	-6.337***
	(1.929)	(1.949)	(1.831)
constant	-4.320	17.137	-8.148
	(9.035)	(10.920)	(6.643)
observations	300	297	295
R-squared	0.489	0.469	0.463
year FE	YES	YES	YES

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Table 14 -	Reculte	ot roa	roccion	onols	70101	Model	·)
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Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The table shows the results of regression analysis. Model 4: $ESG_{(t+1)}$ as dependent variable. Model 5: $ESG_{(t+2)}$ as dependent variable. Model 6: $ESG_{(t+3)}$ as dependent variable.

	ENV _(t+1)	ENV _(t+2)	ENV _(t+3)
explor_dummy	2.190	3.587	5.553**
	(2.955)	(2.826)	(2.694)
Size	9.795***	10.506***	10.076***
	(0.703)	(0.708)	(0.712)
ln ROE	3.162	-1.220***	-2.291
_	(2.987)	(0.441)	(1.491)
ln_leverage	1.777	-3.362*	-1.124
_ •	(1.441)	(1.882)	(0.981)
In tangibles	-3.624**	-4.852*	1.282
_ 0	(1.718)	(2.661)	(1.402)
RD/sales	-0.130	0.039	0.078
	(0.178)	(0.137)	(0.147)
RD_miss	-8.414***	-8.074***	-8.548***
-	(2.651)	(2.596)	(2.502)
constant	-39.278**	-1.861	-27.297***
	(15.623)	(14.219)	(9.690)
observations	299	297	295
R-squared	0.446	0.460	0.464
year FE	YES	YES	YES

Table 15 - Explorative M&A and ESG performance – environmental pillar (Model 3)

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 16 - Explorative M&A and ESG performance - social pillar (Model 4)

	$SOC_{(t+1)}$	$SOC_{(t+2)}$	$SOC_{(t+3)}$	
explor_dummy	5.105*	4.786*	4.345	
	(2.860)	(2.799)	(2.677)	
Size	9.107***	8.239***	7.737***	
	(0.657)	(0.701)	(0.709)	
ln_ROE	4.930**	-1.126*	3.546	
	(1.943)	(0.656)	(2.222)	
		-		
ln_leverage	-0.270	5.284***	-2.607**	
	(1.320)	(1.724)	(1.017)	
ln_tangibles	-8.021***	-3.936	-0.838	
	(1.705)	(3.279)	(1.598)	
RD/sales	0.080	0.050	-0.014	
	(0.205)	(0.239)	(0.247)	
RD_miss	-5.163**	-5.925**	-6.406**	
_	(2.425)	(2.471)	(2.472)	

constant	-16.854	22.323	-20.907*
	(12.072)	(14.939)	(12.221)
observations	299	297	295
R-squared	0.439	0.388	0.364
year FE	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Table 17 - Explorative M&A and ESG performance – governance pillar (Model 5)
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	GOV _(t+1)	GOV _(t+2)	GOV _(t+3)
explor_dummy	8.208**	8.874***	4.538
	(3.219)	(3.225)	(3.094)
Size	4.646***	4.609***	4.695***
	(0.835)	(0.860)	(0.868)
ln_ROE	-2.771	1.102	-1.743
	(2.293)	(0.916)	(2.228)
ln_leverage	-0.754	0.984	-0.492
_ •	(1.382)	(1.975)	(1.270)
In tangibles	-1.955	-4.902*	-0.432
_ •	(1.812)	(2.857)	(1.746)
RD/sales	-0.180	-0.241	-0.164
	(0.265)	(0.235)	(0.214)
RD miss	-5.868**	-6.671**	-5.827**
-	(2.712)	(2.757)	(2.777)
constant	37.594***	27.960*	28.662**
	(13.850)	(14.977)	(13.110)
observations	300	297	295
R-squared	0.207	0.209	0.172
year FE	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 18 - Exploitative M&A and ESG performance – environmental pillar (Model 6)

•	*		• • • •	
	ENV _(t+1)	ENV _(t+2)	ENV _(t+3)	
exploit_dummy	-2.477	-2.673	-4.112*	
	(2.349)	(2.306)	(2.254)	
Size	9.777***	10.488***	10.057***	
	(0.700)	(0.705)	(0.710)	
ln_ROE	3.191	-1.082**	-1.717	
_	(3.030)	(0.458)	(1.421)	
ln_leverage	1.701	-3.016	-0.823	
	(1.434)	(1.944)	(1.010)	
ln tangibles	-3.278*	-5.005*	1.343	
	(1.722)	(2.655)	(1.421)	
RD/sales	-0.143	0.019	0.056	

	(0.182)	(0.143)	(0.156)
RD_miss	-8.130***	-7.838***	-8.112***
	(2.669)	(2.624)	(2.519)
constant	-38.347**	-0.671	-27.084***
	(15.751)	(14.187)	(9.538)
observations	299	297	295
R-squared	0.447	0.459	0.463
year FE	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Table 19 - Exploitative M&A and ESG performance – social pillar (Model 7)

	SOC _(t+1)	SOC _(t+2)	SOC _(t+3)
exploit_dummy	-3.881*	-4.510**	-5.230**
exploit_dulling	(2.121)	(2.147)	(2.168)
Size	9.088***	8.199***	7.707***
	(0.661)	(0.702)	(0.702)
ln_ROE	4.962**	-0.906	4.175*
	(1.970)	(0.650)	(2.219)
ln_leverage	-0.341	-4.720***	-2.207**
	(1.319)	(1.728)	(1.024)
ln_tangibles	-7.481***	-4.281	-0.891
	(1.706)	(3.326)	(1.629)
RD/sales	0.054	0.021	-0.030
	(0.202)	(0.230)	(0.233)
RD_miss	-4.767*	-5.492**	-5.732**
	(2.442)	(2.493)	(2.461)
constant	-15.145	24.592	-20.500*
	(12.234)	(15.110)	(12.211)
observations	299	297	295
R-squared	0.439	0.391	0.372
year FE	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 20 - Exploitative M&A and ESG performance – governance pillar (Model 8)

	$\text{GOV}_{(t+1)}$	$\text{GOV}_{(t+2)}$	GOV _(t+3)
exploit_dummy	-5.635**	-5.445**	-4.111
	(2.471)	(2.503)	(2.504)
Size	4.637***	4.582***	4.674***
	(0.833)	(0.869)	(0.861)
ln ROE	-2.718	1.400	-1.207
_	(2.290)	(0.950)	(2.168)
ln leverage	-0.835	1.714	-0.185
_ •	(1.361)	(1.991)	(1.298)

In tangibles	-1.172	-5.105*	-0.420
_ •	(1.830)	(2.858)	(1.754)
RD/sales	-0.219	-0.287	-0.181
	(0.248)	(0.226)	(0.204)
RD_miss	-5.336*	-6.236**	-5.346*
	(2.765)	(2.807)	(2.795)
constant	40.030***	30.061*	28.926**
	(13.659)	(15.317)	(12.839)
observations	300	297	295
R-squared	0.203	0.202	0.174
year FE	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

3.5. Discussion and conclusion

3.5.1. Discussion

The dramatic increase in CSR/ESG popularity has inevitably affected the market for corporate control. Mergers and acquisitions are well-recognized strategic tools that allow adaptation in challenging environments (Bauer, Friesl and Dao, 2022). By resorting to acquisitions, firms can aim to achieve superior ESG performance (Meglio, 2020), either voluntarily as part of their strategy and vision, or as a result of pressure from activist shareholders (Deng, Kang and Low, 2013). Even in cases where social responsibility issues do not represent the driving force behind M&A operations, companies are increasingly called to assess the ESG implications of an acquisition into their M&A strategy (PWC, 2012), to prosper in the current competitive arena, set by the new sustainability imperative. On the other hand, recent literature urges a rethinking of the prevailing shareholder perspective traditionally adopted in acquisition research to evaluate M&A implications, by embracing a stakeholder perspective (Bettinazzi and Zollo, 2017; Meglio, 2020), more suited to comprehensively understand the complex and wide-ranging M&A value creation mechanisms. To answer the call for a greater consideration of nonfinancial consequences and evaluation metrics in M&A research (González-Torres et al., 2020; Meglio, 2020), this study examines the effects of M&A transactions along the environmental, social, and governance pillars. Further, shortages in previous studies (Tampakoudis and Anagnostopoulou, 2020b; Barros et al., 2022)

regarding the inclusion of acquisition motives into the analysis are addressed, thus distinguishing between the explorative vs. exploitative nature of the acquisition. Using a sample of 300 European firms that successfully carried out an acquisition between 2010 and 2018, the present work therefore investigates the relationship between explorative/exploitative-oriented M&A operations and firm ESG performance in the three years after M&A, to provide insight into the role of companies in contributing to sustainability performance by means of differently motived acquisitions. My results reveal that acquisitions carried out with the intent of 'exploring new possibilities', in terms of geographical expansion, product diversification and/or learning for innovative purposes, produce a positive impact on a firm ESG performance in the long term, i.e., in the three subsequent years. To the extent that a positive association between explorative acquisitions and exploratory innovative outcomes is found across previous studies (Lange and Wagner, 2021), these results appear to support that a firm ESG commitment benefits from innovation (Dicuonzo et al., 2022), especially in the form of a more radical redesign of processes and products. Further, by deconstructing the ESG score into its three components, it emerges that in the two years following the acquisition, the main dimension positively affected is the governance pillar, while in the third year the environmental dimension is positively impacted. This supports that an exploratory orientation can foster a firm's stakeholder orientation, i.e., the degree to which a firm's management decides to focus its attention on stakeholders and integrate their interests and knowledge in its decision making (Bettinazzi and Zollo, 2017). This in turn leads to substantial investments in organizational systems and processes (Sharma and Henriques, 2005) and the development of a dynamic, proactive corporate strategy, involving continuous innovation and improvement, for managing the business-natural environment (Aragón-Correa and Sharma, 2003). By contrast, findings of the study indicate that acquisitions oriented to 'exploiting old certainties' are negatively associated with a firm ESG performance in all the three years subsequent to deal completion. This implies that exploitative acquisitions externalize some costs to certain categories of stakeholders (Waddock and Graves, 2006). Particularly, in the year following acquisition, this type of acquisitions negatively impacts the governance pillar, thus, conversely to

explorative acquisitions, it appears to be detrimental for good governance and stakeholder-related practices. This therefore explains the negative effect observed in the subsequent two years on the social dimension, which accounts for lay-offs, reduced commitment to employee satisfaction, decreased initiatives toward local communities, etc.

3.5.2. Theoretical contributions

In the process, the study makes a number of contributions. Specifically, I contribute to the developing literature at the intersection of M&A and CSR research, which has mainly focused on the impact of CSR on M&As (Aktas, de Bodt and Cousin, 2011; Gomes and Marsat, 2018; Boone and Uysal, 2020a), by adding empirical evidence on the effect that M&As have on acquirers' ESG performance (Tampakoudis and Anagnostopoulou, 2020b; Barros et al., 2022). In this respect I enrich previous findings by highlighting that not all M&A are alike, and consequently produce notably different impacts, depending on the motives underlying the operation. The study also contributes to the acquisition literature in broader terms. Particularly, I bring a contribution to the work on acquisition motives (e.g., Devos, Kadapakkam and Krishnamurthy, 2009; Rabier, 2017) by identifying announced motives and linking them to performance. Few studies (Krishnan, Hitt and Park, 2007; Rabier, 2017; Aalbers, McCarthy and Heimeriks, 2021) have described performance implications of announced motives, while most M&A research has inferred them from target or industry characteristics (Valentini, 2012) or acquisition outcomes (Devos, Kadapakkam and Krishnamurthy, 2009). The distinction between the explorative or exploitative nature of acquisitions has been leveraged by prior research (Aalbers, McCarthy and Heimeriks, 2021) to better understand reasons for heterogeneity in market reactions to deal announcements. I add to this line of research by examining the relationship between the announced motive and the acquirer's longer-term performance, overcoming issues related to the concrete predictive ability of short term expected performance (Zollo and Meier, 2008). Further, the work relates to the stream of studies debating on acquisition performance measurement (King et al., 2004; Meglio and Risberg, 2011; Meglio, 2020), by acknowledging the limitations stemming from the adoption of short-term financial metrics, and thus accounting for M&A implications on non-financial performance in the long-term. Finally, the study is intended to bring a contribution to the growing stream of literature aimed at understanding what drives firms' sustainability performance (e.g., Sikka, 2010; Miotto and Rom Rodríguez, 2017; Govindan *et al.*, 2021; Crace and Gehman, 2022; Rasche *et al.*, 2022), which to date has mostly investigated variables related to ordinary business management, such as CEO and board characteristics (Govindan *et al.*, 2021; Crace and Gehman, 2022), teaching and training programs (Miotto and Rom Rodríguez, 2017; Cottafava, Cavaglià and Corazza, 2019), firm attributes (Rasche *et al.*, 2022), industry (Garcia, Mendes-Da-Silva and Orsato, 2017; Crace and Gehman, 2022) and country effects (Matten and Moon, 2008). In this respect, the study sheds light on how structural changes brought about by the M&A process, can be beneficial or harmful for firm ESG performance depending on the magnitude of costs externalized to stakeholders in the post-merger phase.

3.5.3. Managerial implications

The study also yields managerial implications. The proposal for a Corporate Sustainability Reporting Directive European Commission (2021), that would result in the adoption of a set of reporting standards under the new legislation for reports published in 2024, undoubtedly puts further pressures on firms and requires managers to take action. M&A operations can represent a strategic option to cope with such changing environment, since they allow to: 1) shape the company's taxonomy score, laid down by the proposed directive, which is related to the proportion of revenue, OPEX and CAPEX coming from activities aligned with the technical screening criteria set (eligible economic activities); 2) achieve/maintain a high ESG score, thus ripping the financial and reputational benefits deriving from it. However, the data suggest that a beneficial effect is experienced by acquiring firms in the post-acquisition period (in the three years after deal completion) when carrying out purely explorative acquisitions, whilst in cases where the achievement of economies of scale, the increase in market share and/or financial synergies considerations, are the exclusive motive for the acquisition, M&As are detrimental for the ESG performance. Despite this latter type of acquisition represents a potentially valuable means to dilute short-term costs of sustainability investment, refine and improve the firm's existing practices to ensure sustainability, gain efficiency in business processes that can lead to emissions and waste reductions, while introducing eco-friendly solutions in existing products. However, downsides related, for instance, to lay-offs, reduced commitment to employee satisfaction, decreased initiatives toward community, have to be carefully taken into account and managed in the integration stage. Given the above impacts of M&A activity on social responsibility, regulators and antitrust authorities involved in M&As should pay a greater attention to sustainability issues, considering the new regulatory landscape on sustainability.

3.5.4. Limitations and future research

The study is not free from limitations. Although it provides insights on the link between M&A activity and sustainability performance, it does not take into account other variables that can shape this relationship. The very different impact found to be exerted by distinct types of acquisitions is, therefore, suggested as a valuable starting point for future research. In this vein, scholars are encouraged to bring forward the analysis by investigating the moderating effect of internal and external contingency variables, as well as providing evidence of mediating effects to better explain causation. Additionally, the study is limited to the investigation of pure acquisition motives, i.e., only explorative or exploitative, in order to isolate their effects. I recognize, however, that excluding acquisitions undertaken with a combination of motives does not allow taking into account the often mixed nature of acquisitions (Sears and Hoetker, 2014a; Aalbers, McCarthy and Heimeriks, 2021). A more refined classification of motives could be adopted to quantify the magnitude of exploration and exploitation in ambidextrous acquisitions, in order to extend the analysis to include multiple M&A facets. Yet, the study does not adopt a temporal perspective in looking at the nature of acquisitions, by intentionally eliminating cases where the same firm carried out more than one acquisition in the time span considered. However, considering the shift from a predominant acquisitive behavior to another (from explorative to exploitative, and vice versa), to unveil how and to what extent the dynamics of this change affect a firm sustainability-orientation, can represent a fruitful direction for future research. Further, investigating the sequential switching between exploration and exploitation can open up opportunities to deepen the current understanding on target identification (Gomes, 2019; Boone and Uysal, 2020a), by examining how the interaction between internal and environmental factors shape target selection criteria, and the linkage with integration strategies put in place. Finally, the present study leverages a sample of acquiring firms located in Europe, arguing that it represents an attractive empirical setting. This is due to the high commitment demonstrated by the European Commission in promoting sustainable development over time, and consequent regulatory requirement set on European companies. However, prior works provide evidence of the significant role played by the institutional context in explaining ESG performance of firms (Husted and Sousa-Filho, 2017), thus comparisons with other countries, for instance US or emerging markets, can provide an enrichment and extension of my findings.

Chapter 4 - How Do Green Firms Hide Brown Acquisitions? A Signaling Theory Perspective

4.1. Introduction

Organizations experience severe pressure to become green. Environmental, social and governance (ESG)-oriented business practices are urged by a wide range of stakeholder groups - governments, NGOs, institutional shareholders, community groups, employees, suppliers and customers (Fernandez-Feijoo, Romero and Ruiz, 2014; Helmig, Spraul and Ingenhoff, 2016). Taken together, these stakeholders force companies to demonstrate the beneficial or harmful impact of their corporate activities on social welfare. As such, ESG conform investing has witnessed an unprecedented increase in the last years (Gillan, Koch and Starks, 2021). This becomes evident by sustainable funds that globally attracted inflows of USD 142.5 billion only in the fourth quarter of 2021 and the number of sustainable funds reaching 5,932 at the end of 2021. The growing managerial importance of ESG or corporate social responsibility more widely, goes hand in hand with an increasing research interest among academics from various fields, such as corporate finance (Becchetti, Ciciretti and Hasan, 2015; Breuer et al., 2018; Buchanan, Cao and Chen, 2018; Chang et al., 2019), management (Wagner and Schaltegger, 2004b; Brammer and Millington, 2008b; Carroll and Shabana, 2010; Tang, Hull and Rothenberg, 2012b; Shaukat, Qiu and Trojanowski, 2016; Kim, Lee and Kang, 2021), marketing (Öberseder, Schlegelmilch and Gruber, 2011; Lii, Wu and Ding, 2013; Deng and Xu, 2017) and accounting (Cho and Patten, 2007; Arjaliès and Mundy, 2013).

ESG, as a form of strategic investment (Hart, 1995; McWilliams, Siegel and Wright, 2006a), benefits companies by means of cooperative and trusty relationships with stakeholders (Jones, 1995), reputation building or maintenance (McWilliams, Siegel and Wright, 2006), access to capital (Cheng, Ioannou and Serafeim, 2014), value preservation through insurance-like effects during adversities (Godfrey, Merrill and Hansen, 2009b; Shiu and Yang, 2017). As such,

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it is not surprising that there is empirical evidence suggesting that ESG commitment constitutes a source of competitive advantage.

However, other studies suggest that CSR initiatives impose significant costs (Walley and Whitehead, 1994) and that only financially successful companies can afford these (Mittal, Sinha and Singh, 2008). Further, there is evidence that these initiatives negatively affect shareholder value creation (Hillman and Keim, 2001), or that the inclusion/deletion in top CSR firms' indices has an immaterial effect on stock price reactions (Hawn, Chatterji and Mitchell, 2018; Durand, Paugam and Stolowy, 2019). Combined, there is no univocal empirical evidence on the financial impact of CSR engagement (McWilliams and Siegel, 2000; Zhao and Murrell, 2016; Awaysheh et al., 2020).

Despite the wide range of potential effects on firm performance, pressures around ESG investment have increased, as for example the European Union or the United Kingdom made ESG reporting mandatory for a broad range of firms (Baboukardos, 2017; Doni et al., 2020; Baumüller and Sopp, 2022). This is also expected to happen in the United States where ESG reporting so far remains a voluntary activity. The ESG movement has had a notable impact on mergers and acquisitions (M&A) activity, a core tool to execute strategy and a form of strategic investment (Barros et al., 2022). For example, Deloitte reports that ESG deals have increased from \$92 billion in 2020 to \$103 billion in the first half of 2021 only, with numerous significant acquisitions in the consumer, finance, technology, and chemicals sectors.

Indeed, M&As are an opportunity for firms to improve their own ESG scores through the acquisition of high scoring ESG targets. This approach might help firms to leverage on a high ESG rating of a target firm. For example, in terms of promotion, labor costs, or brand reputation (McWilliams, et al., 2006). Thus, it is not surprising that the green finance literature has recently begun to investigate the effect of different ESG dimensions on M&A decisions (Aktas, de Bodt and Cousin, 2011; Deng, Kang and Low, 2013; Gomes and Marsat, 2018; Arouri, Gomes and Pukthuanthong, 2019). M&As are a meaningful context to better understand the relationship between ESG and financial performance. Simply, M&As represent investment decisions, which can significantly impact the wealth of shareholders

(Deng, Kang and Low, 2013; Gomes and Marsat, 2018). Hence, studies have examined the effect of CSR on M&As, focusing on stock market reactions (Aktas, de Bodt and Cousin, 2011; Deng, Kang and Low, 2013; Arouri, Gomes and Pukthuanthong, 2019; Krishnamurti *et al.*, 2019a), the probability of deal completion (Deng, Kang and Low, 2013; Hawn, 2021) and duration (Hawn, 2021), premiums (Gomes and Marsat, 2018; Ozdemir, Binesh and Erkmen, 2021), and post-M&A performance (Deng, Kang and Low, 2013; Kwon, Lim and Lee, 2018b; Tampakoudis and Anagnostopoulou, 2020a; Chen, Liang and Wu, 2022). Some studies have linked CSR and target selection, by linking the acquirer's tendency to acquire firms with similar ESG performance (Krishnamurti *et al.*, 2019a; Boone and Uysal, 2020b) to reduce reputational risks associated with ESG low-rated firms. Indeed, there is evidence for a positive impact on an acquirer's market and operating performance when acquiring green firms (or firms with a high ESG score) (Tampakoudis and Anagnostopoulou, 2020a; Barros *et al.*, 2022).

It is therefore not surprising that there was a serious increase in the popularity of the acquisition of green targets in recent years. This increase in demand also results in an increase in prices and corresponding premiums paid for green targets (Kwon, Lim and Lee, 2018b). However, higher premiums reduce the likelihood for shareholders to benefit from acquisitions (King et al., 2004, 2020a), making the acquisition of brown firms potentially highly attractive when seeking for profits (Kwon, Lim and Lee, 2018b). As such, I hold that despite the pressures to acquire green, firms might acquire brown targets despite the corresponding reputational risks, as the financial benefits might outweigh these. Drawing on signaling theory, I argue that green firms might acquire brown targets, but they conduct these acquisitions in a way that allows them to reduce and control the risk of reputational damages by minimizing the sending of incongruent signals to stakeholders. Simultaneously, firms might aim to strengthen the perception of prior signals indicating 'quality' and 'good intention'. This acquisition conduct refers particularly to target selection, method of payment and the due diligence process, all activities that send signals to stakeholders. At the same time, based on prior ESG/CSR research in the M&A context, I propose that such companies will also aim to substantially preserve their sustainability performance by leveraging such

variables, in order to foster the transfer of ESG/CSR practices from the acquirer to the target after deal closing, and thus create gains for the combined entity's shareholders.

Based on a sample of 368 M&A deals completed in the period 2010-2021, I show that green companies acquire brown firms and employ strategies involving the acquisition of smaller target firms, the use of higher percentages of cash and the speeding up of the deal completion time to mitigate the reputational risks. I examine the outcome of such strategic approaches in terms of changes in the acquiring firm's ESG performance post-M&A. The results support my line of argument, even though acquirers experience a deterioration in their ESG performance after the acquisition of brown targets. However, targeting companies of a smaller relative size and engaging in cash-financed deals helps to maintain a high-ESG reputation in the year following deal completion, while carrying out a shorter due diligence process seems counterproductive.

This study aims to contribute to extant research in many ways. First, I intend to contribute to the burgeoning literature at the intersection of CSR/ESG and M&A research (Aktas, de Bodt and Cousin, 2011; Gomes and Marsat, 2018; Boone and Uysal, 2020b). In this regard, my study draws attention to a broadly underinvestigated type of M&A, namely the acquisition of low-rated ESG or brown companies by high-rated ESG companies. Most previous studies, indeed, have addressed the case of 'green' acquisitions (Gomes and Marsat, 2018; Kwon, Lim and Lee, 2018b; Tampakoudis and Anagnostopoulou, 2020a) to understand their value creation implications. I complement this research by focusing on 'brown' acquisitions, aiming to develop new insights on the management and the implications of potentially value-destroying acquisitions, in terms of market performance (Zhang et al., 2022) and green reputation (Boone and Uysal, 2020). Although some studies have considered deals involving firms with largely dissimilar ESG reputation (Boone and Uysal, 2020b; Hussain and Shams, 2022), they focus on pairing likelihood (Boone and Uysal, 2020), or takeover premiums and gains (Boone and Uysal, 2020b; Hussain and Shams, 2022). Therefore, my study provides a new perspective on ESG investment by investigating how green companies manage the acquisition of brown firms. As such, I investigate how firms

reduce negative spillover effects deriving from the acquisition of brown targets, and the impacts of such acquisitions on the ESG performance of the combined entity following M&As. In doing so, I broaden the debate of ESG in the finance M&A literature by integrating the strategic management component of M&As.

Second, M&A events can be perceived by stakeholders as incongruent signals. I complement signaling theory's applications to the M&A context, where scant academic attention has been devoted to signals' drawbacks (Wu, Reuer and Ragozzino, 2013a). Indeed, prior research has mainly examined how acquirers can amplify the strength and intensity of signals (Reuer, Tong and Wu, 2012; Choi, Christmann and Kim, 2015; Wu and Reuer, 2021c), and focused on the advantages of signaling to cope with target's adverse selection (Choi, Christmann and Kim, 2015) and enhance M&A performance (Aktas, de Bodt and Cousin, 2011; Zhang, Zhang and Yang, 2022). However, this literature has overlooked how firms can minimize the effect of sending potentially negative or incongruent signals. Therefore, I extend this stream of research by proposing that high-rated ESG companies will try to mask the signal being sent through brown M&A deals, and simultaneously reinforce prior signals of CSR commitment, by harnessing deal characteristics.

Third, I aim to contribute to CSR research, particularly to the business case for sustainability research (Kurucz, Colbert and Wheeler, 2009; Carroll and Shabana, 2010) focusing on CSR as a valuable means for reputation building and insurance (McWilliams, Siegel and Wright, 2006a; Godfrey, Merrill and Hansen, 2009b; Shiu and Yang, 2017). While most studies have addressed strategic instruments utilized by firms to signal their 'doing good' (Adams, Tashchian and Shore, 2001b; Simaens and Koster, 2013b; Dutot, Lacalle Galvez and Versailles, 2016; Sethi, Martell and Demir, 2016) and to restore corporate image following environmental and social reputation crises (Corazza et al., 2020; Lauwo, Kyriacou and Julius Otusanya, 2020), less attention has been devoted to strategic approaches implemented to manage stakeholders' perceptions about a firm's 'doing good' while 'doing harm' (Minor and Morgan, 2011). Thus, the study complements the existing CSR literature by giving insights on how firms pro-actively preserve their high ESG reputation when taking inconsistent actions, or acquiring brown firms.

The reminder of the paper is organized as follows. In section 4.2 the theoretical background and conceptual model is presented. In section 4.3 hypotheses are developed. Section 4.4 describes the methodology adopted to conduct the research. Section 4.5 shows empirical results of the analyses. I discuss key findings and implications in section 4.6 and section 4.7 concludes the study.

4.2. Theoretical background

Reducing reputational losses: a signaling theory perspective

Signaling theory suggests that, in the presence of information asymmetry between two parties, the better-informed party (the sender) can potentially reduce the asymmetry by communicating (i.e., signal) to the less informed party (the receiver) (Spence, 1973, 2002; Connelly et al., 2011). Information asymmetry may relate to two broad elements of information: information about quality and information about intentions (Stiglitz, 2000). M&As constitute a well-recognized signaling device of an acquirer's resources, capabilities and aspirations (Chalençon et al., 2017). Through acquisition announcements, different signals are intentionally or unintentionally conveyed to the market (Gaur, Malhotra and Zhu, 2013; Ranju and Mallikarjunappa, 2019; Filip et al., 2022). For example, an acquisition in a growing market provides a signal about a company's desire for growth and development, but simultaneously indicates potential future prospects for rival firms (Gaur, Malhotra and Zhu, 2013).

Likewise, CSR or ESG performance have been highlighted as signals of a firm's ethical behavior that might reduce information asymmetry towards stakeholders by conveying information about its quality and 'good' intentions. Dating back to the 1990s, CSR actions, such as investing in charitable initiatives have been seen as a positive signal by socially responsible businesses, resulting in a positive impact on firm reputation (Fombrun and Shanley, 1990). Over time, a variety of signaling instruments have emerged, including the publication of ethical codes (Adams, Tashchian and Shore, 2001b), the adoption of certifying systems (Bansal and Hunter, 2003), membership of sustainability rating systems (Robinson, Kleffner

and Bertels, 2011), and the use of corporate disclosures (Simaens and Koster, 2013b; López-Santamaría *et al.*, 2021).

Recent studies propose that the acquisition of a socially responsible firm can be used as a signal, sent by an acquirer to the market, indicating the willingness to increase or maintain the own ESG performance (Aktas, de Bodt and Cousin, 2011). From the perspective of a company with an established ESG reputation, acquiring a firm with a similar reputation appears the best option to preserve a high green status (Boone and Uysal, 2020). However, it has been argued that both high-rated ("green") and low-rated ("brown") companies can be acquisition targets (Fairhurst and Greene, 2022). This paradox can be explained by the high value of ecopremiums resulting from the increased demand for green targets, which negatively impacts shareholders' wealth (Kwon et al., 2018). In addition, some empirical evidence suggests that the acquisition of firms with positive ESG indicators may not be rewarded by investors (Krüger, 2015; Nofsinger, Sulaeman and Varma, 2019; Fairhurst and Greene, 2022). Simply, green firms acquiring green targets often do not experience any change in their environmental classification after the acquisition (Boone and Uysal, 2020). Thus, high-reputation companies do not always benefit from investing in reputation assets that signal their high quality compared to rivals. This suggests the possibility of a trade-off in the management of reputation, where firms with a higher green reputation weigh their quality and the cost of the signal (Bergh et al., 2010). In light of this, green companies can be discouraged to acquire green targets, which are high-cost signals, and turn their attention to brown companies by simultaneously trying to reduce the signals they send. As such, we argue that companies will put in place acquisition approaches in the pre-merger stage, in relation to target selection, decision on the method of payment and length of the due diligence process, in order to minimize reputational losses and maintain their high ESG rating.

I propose two explanations to strategic acquisition approaches implemented by green companies. The first explanation is grounded in the signaling nature of ESG scores. The acquisition of a low-rated firm by a high-rated company can be perceived by stakeholders as an 'incongruent signal'. Companies recognized for their 'goodness' and high-quality are showing to be unconcerned about the

'badness' of their 'brown' targets, consequently outshining the benefits from prior signals (Stern, Dukerich and Zajac, 2014; Zhang, Zhang and Yang, 2022). Since attributes of firms affect the observability of signals emitted (Mukherjee, Makarius and Stevens, 2018), M&A announcements are likely to result in even more visible signals, when stemming from high ESG reputation companies. Thus, I propose that such companies will try to muffle this dangerous signal to reduce the risk of reputational losses when it reaches signal receivers (i.e., stakeholders). Meanwhile, since reputation formation can be seen as a signaling process (Chalençon et al., 2017), I argue that, when current reputation is threatened, companies will tend to send signals that are consistent with their high ESG 'quality' to mitigate incongruent signals' perception and reinforce the credibility of prior signals. Therefore, on one side companies will try to increase information asymmetry to hide negative perceptions associated with their 'bad' intentions; on the other side, they will leverage on their CSR image to signal 'good' intentions. This entails conveying signals about their intention to transform 'devil' targets into 'saints'.

The second explanation relates to the substantial risk of negative spillover effects expected after the acquisition. Negative spillovers emerge when the ability of the combined entity to engage in and extract a surplus from implicit and explicit contracts decreases (Boone and Uysal, 2020). Indeed, Boone and Uysal (2020) observe that pairing with dissimilar reputational groupings resulted in 53.8% of green acquirers losing their greenness in the post-acquisition period. Thus, acknowledging the risk of experiencing a drop in ESG performance, and the consequent loss or related financial benefits, green companies will take actions to restrict negative spillovers aiming to preserve their ESG 'quality'. Prior studies suggest that firms that underinvest in CSR are likely to become takeover targets in corrective deals (Berchicci, Dowell and King, 2012; Fairhurst and Greene, 2022), where the bidder increases CSR to reduce managerial short-termism and/or capitalize on transaction cost savings from delegated philanthropy (Fairhurst and Greene, 2022). Therefore, I hold that acquiring firms will aim to transfer their ESG practices to the target, carrying out a 'turnaround takeover'. As such, an acquirer might signal the intention to 'teach' their best CSR practices to the target firm, in order to create gains for the combined entity (Hussain and Shams, 2022).

4.3. Hypothesis development

Target selection

I hypothesize that the target's size relative to the acquirer represents a key variable to reduce the strength of the signal sent. Firm's size influences the risk level faced by a firm (Godfrey, Merrill and Hansen, 2009a). Larger firms are subject to greater scrutiny from outside constituents (Rindova, Pollock and Hayward, 2006) and face a higher probability to be affected by negative events such as brand devaluation, staff turnover, or less favorable conditions for investments (Godfrey, Merrill and Hansen, 2009b). Smaller targets are generally characterized by a higher level of information asymmetry towards the market (Chae, 2005), so that the acquirer can benefit from a greater information-gap advantage when targeting a relatively small entity. Thus, smaller targets appear to be better candidates when the acquirer aims to avoid negative reputational cascades. Brown acquisitions might represent a signal of the acquirer's willingness to maximize profits, which benefit shareholders' returns, but stands noticeably in contradiction with CSR principles. CSR firms claim the adoption of a stakeholder management approach, where resources are allocated by considering both investing and non-investing stakeholders (Harjoto and Laksmana, 2018). In the eyes of the stakeholders, the acquisition of a smaller target might signal only a smaller impact on the acquiring firm's ESG policies and performance. In addition, integrating larger targets involves major coordination efforts and challenges (Cording, Christmann and King, 2008; King et al., 2020a). Therefore, smaller targets are preferred when strategic change is sought, as in the case of a corrective takeover aimed at turning around the target's ESG performance. Further, when targets are smaller, the potential influence of its managers on the combined entity is likely to be low (Ghosh and Ruland, 1998), increasing the likelihood of adoption and integration of CSR practices in the post-M&A stage. Based on these considerations, I propose:

Hp.1): *High-rated ESG companies acquiring low-rated ESG companies will target companies of a smaller relative size.*

Method of payment

M&A financing decisions unveil the way managers of the acquiring firm assess their company and the value expected to be unlocked through an acquisition (Yook, 2003). In the case of a brown acquisition, where acquirers are likely to be concerned about their 'greenness' loss, the method of payment can be used as a vehicle to convey valuable information to outsiders (Hansen, 1987; Travlos, 1987; Fishman, 1989). It can act as a signaling device to transmit acquirers' confidence over the transaction outcome (Fishman, 1989). In this vein, a higher cash payment is associated with signaling lower post-integration risks (Rappaport and Sirower, 1999). In addition, considering the potentially negative market reactions in the aftermath of a brown acquisition (Krüger, 2015), using cash ensures that the acquirer remains relatively insensitive to any temporary decline in its own share price (Kim, Verdi and Yost, 2020). Further, the payment method can serve as a means to protect an acquirers' ESG reputation by signaling alignment with stakeholder interests (Krishnamurti et al., 2019a) and reducing the risk to lose their support. Along this line of thought, such companies will tend to use cash as a credibility-enhancing device, signaling the firm's ability to keep implicit commitments to stakeholders (Chang et al., 2019), preference for engaging in less risky deals (Krishnamurti et al., 2019a), willingness to reduce agency costs (Travlos, 1987), and potential to benefit from financial institutions' support and high credit ratings (Karampatsas, Petmezas and Travlos, 2014). Therefore, I predict that green companies acquiring brown companies will leverage on cash payment to strengthen their adherence to value-maximizing corporate governance practices, and thus, signaling trustworthiness to stakeholders. The method of payment also influences the complexity of the transaction: cash acquisitions are less complex in terms of valuation (Servaes and Zenner, 1996) and less time-consuming (Boeh, 2011), therefore it can be assumed that green companies will use cash as a strategic device to accelerate the pre-merger stage and reduce negative reputational spillovers. Furthermore, the choice of stock vs. cash is driven by ownership and corporate control considerations (Martin, 1996; Faccio and Masulis, 2005), as it can strongly impact both the acquirer and the target in the post-M&A phase, in terms of ownership structure and controlling rights. In this light, cash transactions allow

acquiring firm's managers to prevent control right dilution after M&As (Martin, 1996; Faccio and Masulis, 2005) and to implement even drastic changes in the target firm's management (Dennis and Dennis, 1995), fostering corrective actions like the implementation of the acquirers' ESG/CSR policies. Taking together the above, I propose:

Hp.2): High-rated ESG companies acquiring low-rated ESG companies will use a higher percentage of cash consideration.

Due diligence process

Due diligence plays a critical role in M&A (Angwin, 2001). Due diligence aims at reducing information asymmetry (Laamanen, 2007) and obtaining a target's relevant information that is not accessible to the public. Two stages can be distinguished, i.e., the private takeover and the public takeover process (Boone and Mulherin, 2007). The first is the period from the private initiation of the takeover to the first public announcement; it involves private information flows between acquiring and target firm to allow the bidder to carry out due diligence, while the terms of the acquisition agreement are negotiated (Wangerin, 2019). The second stage comprises the period from public announcement until deal resolution, i.e., deal completion time. During this phase, referred to as transactional due diligence (Wangerin, 2019), information about the ongoing deal is open to investors and the market (Roh, Hwang and Park, 2021). For investors, the time until deal completion is one of the main signals to update their information set concerning the ex-ante probability that the acquired or merged entity will experience superior or poor postmerger performance (Thompson and Kim, 2020). Studies show that high CSR acquirers take less time to complete (Deng, Kang and Low, 2013; Arouri, Gomes and Pukthuanthong, 2019), since they receive more support from stakeholders (Luypaert and De Maeseneire, 2015). In the case of a brown acquisition, managers of the acquiring firm fear stakeholders' loss of support. Thus, I contend they will be inclined to speed up the process to mitigate reputational losses when deal information becomes public. This leads to the following hypothesis:

Hp.3): *High-rated ESG companies acquiring low-rated ESG companies will reduce the time to deal completion.*

Impacts on the environmental, social and governance performance

Prior evidence suggests that M&As represent a meaningful strategy to strengthen the acquirers' ESG performance (Barros *et al.*, 2022). ESG performance might increase following the acquisition of a ESG aware target (Aktas, de Bodt and Cousin, 2011; Tampakoudis and Anagnostopoulou, 2020a) as the acquirer learns from the target's ESG practices and experiences, and benefits from economies of scale in ESG investing (Aktas, de Bodt and Cousin, 2011). Therefore, the higher the rating spread between the acquirer and the target, the better the improvement in ESG performance after an acquisition (Aktas, de Bodt and Cousin, 2011). Previous studies have rarely taken into account cases where the gap breadth derives from a higher ESG performance of the acquiring firm. Negative spillover effects are associated with lower reputation targets (Boone and Uysal, 2020), resulting in high-ESG companies pairing with targets that share a similar EGS-score (Bereskin *et al.*, 2018; Krishnamurti *et al.*, 2019a; Boone and Uysal, 2020a), by avoiding the acquisition of low-rated firms (Barros *et al.*, 2022). Indeed, Boone and Uysal (2020) point out that no green firm in their sample acquired a 'toxic' one.

However, despite green firms' tendency to target 'clean' and 'safe' companies to protect their image (Vastola and Russo, 2021), a U-shaped relationship between CSR and takeover likelihood has been shown (Fairhurst and Greene, 2022). Some evidence has been provided on the impact of such deals on takeover value (Fairhurst and Greene, 2022; Hussain and Shams, 2022). I focus, however, on the impact of these transactions on the acquiring firm's ESG performance post-M&A. I embrace the negative spillover hypothesis supported by Boone and Uysal (2020), who empirically found that green firms experienced a reduction in environmental performance following the acquisition of 'gray' companies. Thus, I assume that the acquisition of a low-rated target is detrimental for the acquiring firm's ESG performance post-M&A. M&As require serious managerial efforts during acquisition integration, resulting in managerial absorption (Cording, Christmann, and King, 2008), reducing activities such as stakeholder management, or R&D (Ahuja and Katila, 2001). However, these activities are often closely related to the improvement of environmental and social performance (Kuzma *et al.*, 2020). Managing the day-to-day business and, on top of that, the integration of a target firm, might reduce the ability of an acquirer to successfully transfer its own sustainable practices to the target firm. Thus:

Hp.4): The acquisition of a low-rated ESG company by a high-rated ESG company is associated with a reduction in the acquiring firm's ESG performance after acquisition.

However, I assume that, despite the acquirer experiencing a decrease in its ESG performance in the year following the acquisition, high-ESG acquirers maintain their high green reputation afterwards. Drawing upon a resource-based view, ESG strategies have been posited to create sustainable competitive advantage, thus representing a strategic asset (Hart, 1995; McWilliams, Siegel and Wright, 2006a). Indeed, resources that may lead to a competitive advantage include reputation, knowledge assets, long-term relationships with suppliers and customers, and corporate culture (Barney, 1991). The strategic 'business case for sustainability' refers to leveraging on recurring ESG initiatives in order to gain financial benefits and improve long-term firm competitiveness in terms of profitability and growth (Carroll and Shabana, 2010), by integrating them into business strategies (Epstein and Roy, 2001), and 'routinizing' ESG/CSR undertakings to develop consolidated 'practices' (Yuan, Bao and Verbeke, 2011). When ESG/CSR is pursued together with core business goals and is embedded into the corporate decision-making processes, which I assume to be the case with top-rated ESG companies, then ESG/CSR practices constitute an intangible asset, which represents a source of competitive advantage in the long-run. Therefore, I hypothesize that highly aware ESG/CSR companies will maintain their high ESG reputation after the occurrence of a brown acquisition:

Hp.5): The acquisition of a low-rated ESG company by a high-rated ESG company is positively associated with the acquiring firm's ESG performance after acquisition.

The relative size of a target firm compared to the acquiring firm is a critical factor affecting post-acquisition integration (Bauer and Matzler, 2014; Dao et al., 2016). Prior research advocates that M&A transactions are more value-enhancing if the targets are small relative to the acquirers (Alexandridis et al., 2013). Indeed, the acquisition of smaller entities is less complex and allows better capturing of value creation potential (Beitel, Schiereck and Wahrenburg, 2004) since they are easier to absorb (Bauer, Matzler and Wolf, 2016). A large discrepancy between acquirer and target ESG performance can be regarded as a proxy for cultural misalignment between the acquirer and the target firms (Krishnamurti et al., 2019a; Reeves et al., 2019), as it encapsulates aspects associated with employee relations, stakeholder management, environmental corporate practices and board decision making (Alexandridis et al., 2022). Cultural integration is often a crucial obstacle to a successful integration (Weber and Menipaz, 2003). Thus, dissimilar approaches to ESG matters might be associated with inefficiencies in the post-merger integration and diminished synergies. However, if the target's relative size is smaller, the potential for cultural compatibility/fit is stronger Bauer and Matzler, 2014). The acquisition of smaller targets, therefore, can alleviate integration complexity and the challenges of ESG embedding into the corporate culture of the acquired company, by facilitating the creation of a common ground, which leads to increased reliance on informal coordination mechanisms (Puranam, Singh, and Chaudhuri, 2009), and the knowledge transfer (i.e., CSR capabilities) from the acquirer to the new units (Zhao, Lin and Hao, 2019). Still, in turnaround situations, implementing major changes throughout the organization becomes more difficult when the target's size is larger (Barker and Barr, 2002). Considering the above, I formulate the following hypothesis:

Hp.6): The acquisition of smaller low-rated ESG companies is positively associated with the acquiring firm's ESG performance after acquisition.

Prior studies highlight a positive relationship between cash payment and the acquiring firm performance around the announcement date (Travlos, 1987; Amihud, Lev, and Travlos, 1990; Chang, 1998) and post-acquisition (Agrawal, Jaffe, and Mandelker, 1992; Linn and Switzer, 2001; Cui and Chi-Moon Leung, 2020). The method of payment acts as a signal about the acquiring firm's value, with cash offers being interpreted as good news (Travlos, 1987). Therefore, the use of cash consideration, by shaping stakeholders' perceptions about the transaction, can work as an effective umbrella for acquirers' ESG reputation. Travlos (1987) also suggests that mergers financed by cash tend to reduce agency costs. This effect is consistent with attributes of ESG rated firms, namely stakeholder participation and transparency (Cheng, Ioannou and Serafeim, 2014). Consequently, the use of cash payment can be understood by stakeholders as a congruent signal with ESG engagement, thus favoring the renewal of their support to 'good' companies, albeit merging with 'bad' firms. Additionally, cash transactions, being positively associated with stock market performance (Travlos, 1987; Amihud, Lev and Travlos, 1990; Chang, 1998) and post-combination operating performance (Linn and Switzer, 2001; Cui and Chi-Moon Leung, 2020), potentially resulting in greater resources that can be devoted to ESG investments (Nelling and Webb, 2009; Krüger, 2015). Furthermore, acquirers will typically use cash when acquiring poorly performing firms, i.e., low ESG rated firms, in order to restructure them and create value (Halpern, Kieschnick and Rotenberg, 2005). Indeed, the alignment between the acquirer and the target firms' CSR-investment strategies can be more easily pursued through cash deals, where the control right of the target is directly transferred to the acquirer and the target's existing shareholders are eliminated. Based on the above considerations, I formulate the following hypothesis:

Hp.7): The use of cash consideration is positively associated with the acquiring firm's ESG performance after acquisition.

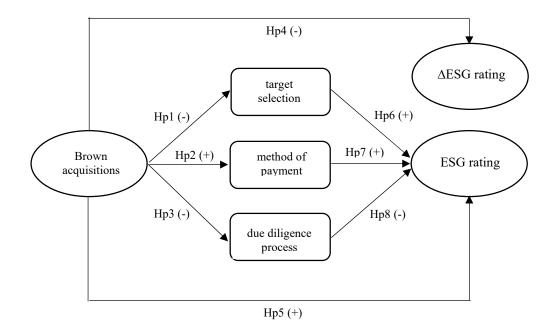
Previous studies suggest the existence of a trade-off in the relationship of time from deal completion and post-M&A performance (Thompson and Kim, 2020). More time spent undertaking adequate transactional due diligence benefits post-merger

performance, as it reduces post-integration risks (Thompson and Kim, 2020). Due diligence enables the acquirer to verify that no "material adverse event" has occurred (Wangerin, 2019), to ensure the quality of financial statements (Skaife and Wangerin, 2013) and to identify "red flags" that might lead to unanticipated problems discovered post-acquisition (Wangerin, 2019). However, beyond an optimal deal closing time, acquirer's post-merger performance suffers due to rising expenditures and opportunity costs from delays (Roh, Hwang and Park, 2021). Therefore, reducing the amount of transactional due diligence before the optimal point, can negatively impact post-acquisition performance. This can be the case of acquirers constraining time to complete the deal, due to reputational concerns. A shorter due diligence process restricts the effective examination of the target beyond the major financial, legal, tax, and future sales projections (Harvey and Lusch, 1995), thus underrating issues which may lead to post-acquisition failure (Argwin, 2001). This is even more visible when companies involved in the deal show cultural divergence. Such dissimilarities might not reveal themselves clearly in the premerger stage and exhibit their drawbacks more noticeably during the postintegration phase. Prior research found that a wider ESG/CSR gap can even deter firms involved from closing the deal and have a negative impact on the probability of deal completion (Alexandridis et al., 2022). Along this line, I assume that speeding up the completion of the deal, hinders the acquirer's ability to critically assess the acquisition backlashes on the post-M&A performance, thus negatively impacting ESG performance after the acquisition. Therefore, I propose that:

Hp.8): The reduction in the time to complete the deal is negatively associated with the acquiring firm's ESG performance after acquisition.

Figure 5 shows the conceptual model.

Fig. 5 - Conceptual model



4.4. Methodology

4.4.1. Sample selection

I use Thomson Financial Securities Data Company (SDC) database to collect information on M&A deals. The total population includes all M&As announced over the 11 years period between January 2010 and December 2021. I narrow down the sample according to the following screening criteria: 1) both the bidder and the target firm are public listed companies; 2) the transaction has been completed before the end of the sample period; 3) the deal value disclosed exceed \$1 million; 4) the bidder seeks to acquire more than 50% of the target's voting stock (Deng, Kang and Low, 2013; Huang, Officer and Powell, 2016); 5) transactions consisting in exchange offers, LBOs, privatizations, recapitalizations, spin-offs, self-tender offers, repurchases, partial stock-stake purchases, and acquisitions of remaining interest, are excluded (Huang, Officer and Powell, 2016; Tampakoudis and Anagnostopoulou, 2020a); 6) information on the consideration structure offered (cash, stock, or cash and stock) must be available; 7) both the acquiring and the target firms do not pertain to the financial industry. These restrictions result in a sample of 2,736 deals. Subsequently, I filter companies based on the availability of ESG and financial data on Thomson Reuters ASSET 4 and Refinitiv Eikon databases, respectively. Specifically, I look for deals where: 1) ESG scores of the acquirer and the target firms are available for the fiscal year prior to the announcement date; 2) the ESG score of the acquirer for the financial data for the fiscal year prior to the announcement are available. After deleting one observation due to the abnormal due diligence length (nearly three years), I can identify 368 transactions with relevant data for the purposes of the study. Table 21 presents the number of observations per year, while the countries involved in the sample appear in Table 22.

Year	#Deal	Proportion (%)
2010	20	5.43
2011	26	7.07
2012	27	7.34
2013	5	1.36
2014	32	8.70
2015	35	9.51
2016	45	12.23
2017	41	11.14
2018	59	16.03
2019	51	13.86
2020	24	6.52
2021	3	0.82
Total	368	100.00

Table 21 - Sample distribution by year

This table provides the sample distribution by announcement year. #Deal denotes the number of deals per year.

	#Acquirer	Proportion (%)	#Target	Proportion (%)
United States	184	50	218	59,24
United Kingdom	30	8,15	22	5,98
Canada	27	7,34	31	8,42
Japan	24	6,52	13	3,53
Australia	20	5,43	38	10,33
France	18	4,89	5	1,36
Germany	12	3,26	3	0,82
Switzerland	8	2,17	3	0,82
India	5	1,36	4	1,09
China	4	1,09	1	0,27
Belgium	3	0,82	1	0,27
Brazil	3	0,82	3	0,82
South Africa	3	0,82	5	1,36
South Korea	3	0,82	2	0,54
Others	24	6,48	19	5,14
Total	368	100	368	100

Table 22 - Home country

This table breaks down the sample by country of domicile. #Acquirer and #Target denote, respectively, the number of acquirers and targets per country.

4.4.2. Measurement of variables

Dependent variable. The dependent variable is the acquiring firm's ESG performance at the fiscal year end after the deal effective date (ESGscore). The study uses ESG scores retrieved from Thomson Reuters' Asset4 database, as one of the largest ESG rating databases (Cheng, Ioannou and Serafeim, 2014). The ESG score captures a company's performance along the three pillars (i.e., environmental, social, and governance) and its value ranges from 0 to 100. Ten main categories of relevant themes (i.e., resource use, emissions and innovation for the environmental pillar; human rights, workforce, community and product responsibility for the social pillar; management, shareholders and CSR strategy for the governance pillar) are assessed based on publicly available company-reported data and receive a score built around 630 critical ESG measures, which is then weighted to consider the number of indicators that make up the single category. A combination of the ten categories formulates the final ESG score, which is ranked by percentile and benchmarked against industry, for all environmental and social categories, and against the country, for all governance categories.

I compute the variation in the acquirer's ESG performance (Δ ESGscore) as follows: (ESGscore_{k+1} - ESGscore_{t-1})/ESGscore_{t-1}, where t-1 indicates the fiscal year prior to the date of announcement and k+1 is the fiscal year after the date effective.

Explanatory variables. I build my independent variable, i.e., the *occurrence of a brown acquisition* (green_brown), using the latest available ESG scores of the acquirer and target firm before the announcement date. After controlling for symmetric distribution of ESG scores, I sort acquirers' and targets' scores into 2 groups based on the median value. Splitting ESG score distributions in two parts is consistent with the ESG rating provided by Thomson Reuters' Asset4, where high-rated companies (assigned with a "A" or "B" grade) show scores between 51 and 100. Consequently, I create a dummy variable (green_brown) coded 1 if the acquisition is carried out by an acquirer with a score above the median and the target's score lies below the median, and 0 otherwise.

The mediating variables considered in the study are measured as follows. Target's *size relative* to the acquirer (relative_size) is the market capitalization of the target compared to that of the acquirer at the fiscal year end prior to the announcement date (Ghosh and Ruland, 1998). *Time to completion* (time_complete) is calculated as the natural logarithm of the numbers of days between the announcement date and the effective date (Dikova et al., 2010; Roh et al., 2021), as reported in the SDC database. *Cash payment* is measured as the percentage of cash (cash%) used by the acquiring firm in the transaction (Faccio & Masulis, 2005), as reported in the SDC database.

Control variables. I include the following control variables related to deal, acquirer and target characteristics that can have an impact on our research model: *intra industry* (intra_industry), a dummy variable that equals 1 if the bidder and target share the same 4-digit NAICS codes and 0 otherwise; *cross border* (cross_border), a dummy variable that takes the value of 1 if the bidder and target countries differ and 0 otherwise; *multi bidders* (multi_bid), a dummy equal to 1 if there were multiple competing bidders for the target and 0 otherwise; *acquisition experience* (acqu_exp), a dummy variable coded 1 if the acquirer carried out more than four acquisitions in the prior five years and 0 otherwise; *acquirer size* (acqu_size), as measured by total assets; *acquirer collateral* (acqu_coll), the ratio of an acquirer's tangible assets to total assets; *acquirer leverage* (acqu_lev), calculated as the ratio of an acquirer's total debt to total assets; *acquirer return on assets* (acqu_ROA); *target high-tech* (target_tech), an indicator variable that equals 1 if the target operates in a high-technology industry and 0 otherwise; *target return on assets* (target_ROA). All financial variables refer to the fiscal year prior to the announcement date and are transformed through the natural log to normalize distributions.

4.4.3. Descriptive statistics

Table 23 presents the summary statistics of all variables used in the sample. The average acquiring firms' ESG score in the year following the deal closing (ESGscore) is 57,03 with a standard deviation (SD) of 20,8%, which is in line with previous research (Gomes and Marsat, 2018; DasGupta, 2021). The acquirer (acqu ESG) and target (target ESG) scores relative to the year prior to the announcement date, which has been used to calculate the dummy variable green brown, show average values of 54,62 and 34,72, respectively, while the median is 56.34 for acquirers and 31.40 for targets. Thus, acquirers on average exhibit higher ESG scores. This supports that firms generally acquire targets with lower ESG performance (Tampakoudis and Anagnostopoulou, 2020a; Hussain and Shams, 2022). Acquirers above the median show an average ESG score value of 73.99, while targets below the median a mean value of 21.54 (Table 24). The mean target's relative size is 0,37 and the median is 0,23, consistently with prior research (Ghosh and Ruland, 1998). The mean value of the natural log of the difference between announcement date and effective date is 4,94, which means about 140 days, averaging from a minimum of 3,53 (34 days) and a maximum of 6,62 (750 days), in line with other studies (Hussain and Shams, 2022). Deals in the sample show an average percentage of cash used as consideration of 60,52%, with a median value of 84,39% and a SD of 44,15%.

Pearson correlation matrix is presented in Table 25. Correlation analysis provides a first signal of the negative relation linking brown acquisitions with relative size (r = -0.23) and deal completion time (r = -0.22), whilst cash % show a positive association (r = 0.23). Furthermore, a positive correlation coefficient between brown acquisitions and the acquirer's ESGscore (r = 0.45) is observed.

	Mean	Median	SD	Min	Max
ESGscore	57,031	60,300	20,789	12,100	91,600
relative_size	0,369	0,230	0,434	0,000	3,220
time_complete	4,937	4,910	0,706	3,530	6,620
cash%	60,520	84,390	44,147	0,000	100,000
acqu_ESG	54,618	56.335	21,788	7,140	93,500
target_ESG	34,717	31.395	17,876	2,010	92,640
green_brown	0,242	0,000	0,429	0,000	1,000
intra_indusry	0,492	0,000	0,501	0,000	1,000
cross_border	0,361	0,000	0,481	0,000	1,000
multi_bid	0,073	0,000	0,261	0,000	1,000
acqu_exp	0,269	0,000	0,444	0,000	1,000
acqu_size	9,429	9,465	1.666	4,500	13,480
acqu_coll	3,012	3,040	0,982	0,000	4,870
acqu_lev	0,230	0,220	0,155	0,000	2,020
acqu_ROA	3,593	3,630	0,376	-0,830	4,490
target_tech	0,188	0,000	0,391	0,000	1,000
target_ROA	5,115	5,170	0,497	-3,730	5,440

Table 23 - Summary statistics

This table reports the mean, median, standard deviation, minimum, maximum of variables used in the sample.

Table 24 - Brown acquisitions

Variable	Obs	Mean	SD	Min	Max
acqu_ESG	89	73.993	10.737	56.4	93.5
target_ESG	89	21.537	6.814	3.99	32.09

This table reports the mean, standard deviation, minimum, maximum of the acquirers' and targets' ESG scores for our subsample of brown acquisitions.

Variables	(1)	(2)	(3)	(4)	(5)	(9)	(2)	(8)	(6)	(10)	(11)	(12)	(13)	(14)	(15)
(1) ESGscore	1.000														
(2) green_brown	0.453 * * *	1.000													
(3) relative_size	-0.323***	-0.230***	1.000												
(4) $\cosh\%$	0.316^{***}	0.226^{***}	-0.423***	1.000											
(5) time_complete	0.022	-0.222***	0.261^{***}	-0.239***	1.000										
(6) intra_industry	-0.186^{***}	-0.111 **	0.188^{***}	-0.174***	0.094*	1.000									
(7) cross_border	0.249^{***}	0.064	-0.138^{***}	0.230^{***}	-0.013	-0.016	1.000								
(8) multi_bid	0.053	-0.037	0.008	0.130^{**}	0.050	0.057	0.005	1.000							
(9) acq_exp	-0.094*	-0.085*	0.000	-0.109**	0.081	0.065	-0.227***	-0.077	1.000						
(10) acqu_size	0.589^{***}	0.223^{***}	-0.384***	0.303^{***}	0.012	-0.246***	0.077	0.060	0.038	1.000					
(11) acqu_coll	-0.041	-0.003	0.084*	-0.277***	0.095*	0.235^{***}	0.018	0.056	0.073	-0.048	1.000				
(12) acqu_lev	0.039	-0.024	0.068	0.038	0.038	0.040	-0.079	0.037	0.024	0.203^{***}	0.009	1.000			
(13) acqu_ROA	0.124^{**}	0.094*	-0.046	0.135^{***}	0.009	-0.097*	0.086*	0.019	-0.067	0.101*	-0.040	0.032	1.000		
(14) target_tech	-0.057	0.038	-0.122**	0.166^{***}	-0.005	-0.083	0.015	-0.002	0.023	-0.008	-0.285***	0.021	-0.052	1.000	
(15) target_ROA	-0.063	-0.137 ***	0.089*	-0.053	0.128^{**}	-0.034	0.009	-0.041	-0.060	-0.023	-0.096*	0.058	0.044	0.055	1.000
*** p<0.01, ** p<0.05, * p<0.1	5, * p<0.1														
This table reports Pearson correlation matrix.	rson correlation	on matrix.													

Table 25 - Correlation matrix

4.4.4. Multivariate analysis

I perform the analysis following these steps. First, I test hypotheses 1, 2, and 3, in order to assess the relationship between the occurrence of a brown acquisition and strategic actions implemented by green companies, by estimating robust ordinary least square (OLS) models (Model 1, 2 and 3). The sample includes some serial acquirers, which may cause autocorrelation and heteroskedasticity, and conflict with the OLS assumptions. I deal with the former by clustering by firm ID and with the latter by estimating a robust OLS regression. Doing so, it allows me to obtain unbiased standard errors. Regressions estimated are reported below:

Relative_size_i =
$$\beta_0 + a_1$$
green_brown_i + $\beta_j \sum$ controls_i + $\lambda_t + \varepsilon_i$ (1)

 $Cash \%_{i} = \beta_{0} + a_{1}green_brown_{i} + \beta_{j}\sum controls_{i} + \lambda_{t} + \varepsilon_{i}$ (2)

 $Time_complete_i = \beta_0 + a_1green_brown_i + \beta_j \sum controls_i + \lambda_t + \varepsilon_i$ (3)

where \sum controls_i is a vector of control variables reported in 4.4.2., λ_t indicates dummies for the year of announcement that I included for controlling omitted factors that can affect my dependent variables, ε_i is the error term, and the other variables are as defined earlier in 4.4.2.

Subsequently, I analyze the impact of brown acquisitions on the ESG performance of the acquiring firm in the year following deal completion (Hypotheses 4 and 5), by estimating the following models:

$$\Delta ESGscore_{i} = \beta_{0} + c_{1}green_brown_{i} + \beta_{j}\sum controls_{i} + \lambda_{t} + \varepsilon_{i}$$
(4)

$$ESGscore_{i} = \beta_{0} + c_{1}green_brown_{i} + \beta_{j}\sum controls_{i} + \lambda_{t} + \varepsilon_{i}$$
(5)

In Model 4 and 5, I use the same control variables as Model 1, 2 and 3. Previous studies investigating the impact of M&As on the bidder's ESG performance mainly consider measures of profitability and capital structure as controls (Barros *et al.*, 2022). However, I also include other deal characteristics to test their potential influence. Additionally, instead of considering the acquirer size in the form of a continuous variable, I create a dummy variable, namely *acqu_medsize*, by dividing the distribution of the acquirers' total assets into two parts and assigning the code 1

to observations above the median and 0 otherwise, to the aim of mitigating a 'size effect'. This choice is consistent with the consideration that ESG scores provided by rating agencies, such as ASSET4, are skewed towards large-sized firms (Krishnamurti et al., 2019), as size mainly determines the data availability and resources for providing ESG data (Drempetic et al., 2020).

Next, I test the mediating role of variables used as my dependent variables in Model 1, 2 and 3, in the relationship between the occurrence of a brown acquisition and the ESG performance of the acquiring firm in the year following deal completion (Model 4). Basically, I follow a causal-step procedure (Baron and Kenny, 1986), leading me to ultimately test the effects of relative size, cash payment, and deal completion time on the acquiring firm's ESG performance, controlling for the presence of a brown acquisition. The relations are expressed by the following regression models:

$$ESGscore_{i} = \beta_{0} + \beta_{1}relative_size_{i} + c'_{1}green_brown_{i} + \beta_{j}\sum controls_{i} + \lambda_{t} + \varepsilon_{i}$$
(6)

$$ESGscore_{i} = \beta_{0} + \beta_{1} cash_{i} + c_{1}^{\prime} green \ brown_{i} + \beta_{i} \sum controls_{i} + \lambda_{t} + \varepsilon_{i}$$
(7)

$$ESGscore_{i} = \beta_{0} + \beta_{1} time \ completion_{i} + c'_{1} green \ brown_{i} + \beta_{i} \sum controls_{i} + \lambda_{t} + \varepsilon_{i}$$
(8)

Then, I compare the coefficient c'₁, indicating the direct effect of X (i.e., green_brown) on Y (ESGscore), with the path $a_1*\beta_1$, indicating the indirect effects of X on Y through relative_size (Model 6), cash% (Model 7) and time_complete (Model 8), respectively. Consistently with hypotheses formulated, I do expect a partial *complementary mediation* of target's relative size and cash percentage, while I do expect a partial *competitive mediation* for the time to deal completion variable, as hp.5 predicts a positive relation (positive direct effect) while hp.8 a negative association (negative indirect effect) (Zhao et al., 2010). The significance of indirect effects is tested using the bootstrapping method (Preacher and Hayes, 2004), which has been suggested to outperform a Sobel z-test (Zhao et al., 2010), and setting 5.000 replications.

4.5. Empirical results

Target selection, method of payment and due diligence process

The regression analysis results for Model 1, 2 and 3 are presented in Table 26. These results confirm hypothesis 1 indicating that high-ESG companies acquire brown firms of a smaller relative size compared to them. Concerning control variables, I found, unsurprisingly, that the larger the acquirer's size, the smaller the relative size of the target firm (β = -0.10, p < .001). Moreover, cross border deals are smaller in size (β = -0.09, p < .05) (Huang, Officer and Powell, 2016), and more leveraged bidders are likely to acquire relatively larger firms (β =0.40, p < .05). While some prior research supports that the acquirers' excess leverage decreases the likelihood of conducting larger deals (Uysal, 2011), it has been argued that leverage puts pressure on managers to enhance firm performance (Gilson, 1990). This can lead to the acquisition of larger companies, which may have high optimal leverage ratios (Harjoto and Laksmana, 2018). Target's profitability is positively related to relative size (β = 0.06, p < .05), while high-tech firms are smaller (β = -0.11, p < .001).

In Model 2, I test the relationship between the occurrence of a brown acquisition and the percentage of cash consideration offered. The results provide evidence for a positive and significant relationship (a=16.43, p < .001), thus supporting Hypothesis 2. The estimated parameters of controls are broadly in line with prior studies (Faccio and Masulis, 2005). Indeed, I find that cross border deals involve a higher propensity for cash payments (β =16.72, p < .001) (Faccio and Masulis, 2005); acquirers are more likely to resort to cash-financing to 'preempt' the competition from other bidders (β =20.98, p < .001) (Fishman, 1989); acquirer's size is positively associated with the use of cash (β =6.01, p < .001) (Faccio and Masulis, 2005; Huang, Officer and Powell, 2016), whilst the acquirer's proportion of tangible assets is negatively related to cash-financed deals ($\beta = -10.95$, p < .001). This latter result contrasts Faccio and Masulis (2005) findings. However, this might relate to the fact that we do not distinguish between the sources of financing (i.e., equity financing, debt financing and internal funds) in cash-paid M&As (Martynova and Renneboog, 2009). The target's return on assets is negatively related to cash payment ($\beta = -5.60$, p < .001) as target shareholders of profitable firms might be more inclined to hold bidder stocks, while firms operating in the high-tech sector are more likely to be paid with higher percentages of cash (β =9.41, p < .1).

Model 3 considers the deal completion time as the dependent variable. The coefficient for our independent variable is negative and statistically significant (a= -0.30, p < .001). This gives support to hypothesis 3, according to which, green companies will tend to shorten the transactional due diligence period. The model, in line with other studies (Roh, Hwang and Park, 2021), shows little significance of the control variables included. Indeed, the relative size between the acquirer and the target and the method of payment have been demonstrated to strongly impact deal completion time (Faccio and Masulis, 2005; Luypaert and De Maeseneire, 2015; Roh, Hwang and Park, 2021); however, I do not insert them in our Model 3 in order to investigate, in subsequent analysis, the individual indirect effects of variables that can operate jointly at the same stage. In separate tests, anyway, I ensured that including target size and method of payment does not alter my main results related to hypothesis 3, thus, supporting that the relationship between brown acquisitions and the due diligence length is not completely explained (mediated) by such variables (see supplemental material for review SMR 1).

Environmental, social and governance performance

Table 27 presents regression estimates for models 4, 5, 6, 7, and 8. The results support hypothesis 4, where a negative relationship between the occurrence of brown acquisitions and the combined entity's ESG performance after M&As was hypothesized (β = -0.07, p < .001) (Model 4), thus indicating that the acquisition of low-scoring targets entails a deterioration in the acquiring firm's ESG performance. Nonetheless, a positive association with the ESG performance post-M&A in absolute terms is supported (β =17.09, p < .001) (Model 5), in accordance with Hypothesis 5. This suggests that green companies maintain their high reputation even after merging/acquiring a low-rated company. In Model 6, it can be observed that the target's size relative to the acquirer shows a negative and significant coefficient (β = -4.93, p < .05), while the coefficient of green_brown is still significant at the 5% level. Therefore, it can be supported that acquiring firms of a smaller relative size is beneficial for ESG performance post-M&A, partially

explaining green firms' high ESG score in the aftermath of a brown acquisition. Results of the bootstrap procedure for testing the significance of indirect effects (IE) are reported in Table 28, where it can be seen that the proportion of the effect of the independent variable (green brown) on the dependent variable (ESGscore) that goes through the mediator (relative size) is positive (IE1=0.83), even though small in size, but statistically significant, as the 95% confidence interval does not include zero. The results also support hypothesis 7, as the coefficient for cash% is positive and statistically significant (β =0.06, p < .001), and the indirect effect is significant as well (0.03 < 95% CI < 1.88), even though the effect size is small (IE2=0.96). Hypothesis 8, concerning the negative impact of due diligence length on the acquiring firm's ESG performance, appears to be supported. Indeed, the coefficient for deal completion time is positive, thus giving support to the direction of the relationship hypothesized, and statistically significant (β =3.64, p < .001). The indirect effect is negative (IE3 = -1.13) and significant (-2.15 < 95% CI < -0.11). Control variables are also informative. ESG performance is found to be positively associated with cross border deals. Since country good governance is portable through cross M&As (Ellis et al., 2017), institutional and cultural distance can create a learning opportunity and potential for CSR transfer (Hussain and Shams, 2022). As expected, acquirer's size is a strong predictor of ESG performance (Barros et al., 2022) as it brings greater visibility from outsiders and legitimacy concerns. Target firms pertaining to knowledge-intensive industries show higher sustainability performance. By contrast, target's ROA is found to be negatively related to ESG performance, supporting some prior evidence on the positive influence of financial performance shortfall on CSR strategies (DasGupta, 2021).

	(1)	(2)	(3)
Green_brown	-0.109***	16.433***	-0.303***
—	(0.042)	(4.880)	(0.093)
Intra industry	0.056	-2.795	0.085
_ *	(0.047)	(4.415)	(0.077)
Cross border	-0.091**	16.724***	-0.016
—	(0.044)	(4.416)	(0.077)
Multi bid	0.034	20.981***	0.091
—	(0.065)	(7.981)	(0.160)

Table 26 - Results of regression analysis: Model 1, 2 and 3

Acqu_exp	-0.040	-3.778	0.050
	(0.046)	(5.191)	(0.084)
Acqu size	-0.096***	6.010***	0.027
	(0.017)	(1.309)	(0.023)
Acqu_coll	-0.001	-10.946***	0.055
	(0.022)	(2.456)	(0.037)
Acqu_lev	0.397**	2.311	0.090
	(0.154)	(14.271)	(0.206)
Acqu_ROA	0.017	9.055	0.087
	(0.037)	(6.437)	(0.082)
Target_tech	-0.109***	9.414*	0.077
	(0.041)	(5.167)	(0.104)
Target_ROA	0.057**	-5.600***	0.144**
	(0.025)	(1.911)	(0.055)
Constant	0.999***	21.273	3.686***
	(0.269)	(29.256)	(0.453)
Observations	368	368	368
R-squared	0.249	0.286	0.144
year FE	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The table shows the results of regression analysis. Model 1: relative_size as dependent variable. Model 2: cash% as dependent variable. Model 3: time_complete as dependent variable.

	(4)	(5)	(6)	(7)	(8)
Green brown	-0.071***	17.091***	16.370***	15.943***	18.189***
Oleen_blown					
D 1 (''	(0.016)	(1.877)	(1.897)	(1.870)	(1.895)
Relative_size			-4.927**		
~ 10/			(2.035)		
Cash%				0.060***	
				(0.022)	
Time_complete					3.643***
					(1.132)
Intra_industry	0.010	-2.597	-2.195	-2.304	-2.918
	(0.022)	(1.839)	(1.822)	(1.829)	(1.809)
Cross_border	0.003	8.579***	8.069***	7.524***	8.641***
_	(0.020)	(1.839)	(1.850)	(1.896)	(1.814)
Multi bid	0.005	2.479	2.567	1.144	2.159
_	(0.032)	(2.839)	(2.832)	(2.756)	(2.888)
Acqu_exp	0.017	-1.146	-1.375	-0.959	-1.317
	(0.026)	(2.006)	(2.011)	(1.974)	(1.968)
Acqu_sizemed	-0.024	16.394***	15.273***	15.687***	15.991***
	(0.021)	(1.797)	(1.877)	(1.813)	(1.788)
Acqu_coll	0.006	-0.521	-0.499	0.153	-0.716
· _	(0.009)	(0.987)	(0.992)	(1.019)	(0.989)
Acqu_lev	0.095*	3.476	4.670	2.716	3.046

Table 27 - Results of regression analysis: Model 4, 5, 6, 7 and 8

	(0.056)	(4.828)	(4.866)	(4.710)	(4.884)
Acqu_ROA	0.001	2.121	2.136	1.526	1.796
	(0.020)	(2.258)	(2.200)	(2.027)	(2.061)
Target_tech	-0.004	-3.817*	-4.411*	-4.409**	-4.124*
	(0.021)	(2.278)	(2.253)	(2.203)	(2.234)
Target_ROA	0.007	-1.356	-1.032	-0.991	-1.866*
	(0.009)	(1.077)	(1.127)	(1.135)	(0.990)
Constant	0.022	39.514***	40.645***	35.308***	25.382**
	(0.127)	(10.457)	(10.469)	(9.974)	(10.576)
Observations	368	368	368	368	368
R-squared	0.059	0.446	0.455	0.458	0.459
year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The table shows the results of the regression analysis. Model 4 considers as dependent variable the variation in the ESG performance before and after acquisition, while Model from 5 to 8 test the impacts of relative_size (Model 6), cash% (model 7) and time_complete (Model 8) on the acquiring firm's ESG performance post-M&A.

	Observed coefficient	Bootstrap std. err.	Z	P>z		ed [95% conf. erval]
IE 1	.8316983	.3986142	2.09	0.037	.0504288	1.612968
IE 2	.9552204	.4699072	2.03	0.042	.0342192	1.876222
IE 3	-1.126708	.5203674	-2.17	0.030	-2.14661	106807

Table 28 - Indirect effects

The table shows indirect effects of mediation analysis resulting from bootstrapping. IE 1: green_brown -> relative_size -> ESG performance. IE 2: green_brown -> cash% -> ESG performance. IE 3: green_brown -> time_complete -> ESG performance.

Sensitivity test

To test the extendibility of results to companies lying at the very lowest and very highest end of the ESG score continuum, I re-estimate the models by sorting the distribution of ESG scores into quartiles (Caiazza, Galloppo and Paimanova, 2021) and creating a dummy variable (*verygreen_verybrown*) coded 1 if the acquisition is carried out by an acquirer assigned to the fourth quartile and the target firm lies in the first quartile, and 0 otherwise. Descriptive statistics of this subsample are reported in Table 29. Results for all models are shown in Table 30, 31 and 32.

Results are supported and effects intensified in magnitude since a beneficial effect derives from the acquisition of smaller targets (IE1=1.28) and the use of cash (IE2=1.73) (Table 12). However, my hypothesis 8), concerning the negative impact of due diligence length on the acquiring firm's ESG performance, appears to not be confirmed for top-rated ESG companies. Indeed, even though the coefficient of the indirect effect is negative (IE2=-1.34), thus giving support to the direction of the relationship hypothetised, it does not show statistical significance. The non-significant effect on ESG performance can be explained by other potential advantages of high-CSR aware companies that counteract the damaging impact of speeding up the deal completion time. For instance, their adherence to high standards of accountability and transparency which favor them in evaluating post-M&A performance, their strong stakeholders' support and their organizational size.

Table 29 - Brown acquisitions

	Mean	SD	Min	Max	Obs
acqu_ESG	83	5.661	75.03	92.22	23
target_ESG	15.351	5.469	3.99	21.9	23

This table reports the mean, standard deviation, minimum, maximum of the acquirers' and targets' ESG scores for our subsample of brown acquisitions.

	(1)	(2)	(3)
VeryGreen_VeryBrown	-0.101**	21.550**	-0.513***
	(0.045)	(8.375)	(0.162)
Intra_industry	0.057	-2.677	0.079
	(0.047)	(4.454)	(0.079)
Cross_border	-0.088**	15.883***	0.006
	(0.044)	(4.459)	(0.078)
Multi_bid	0.042	20.141**	0.101
	(0.065)	(8.015)	(0.159)
Acqu_exp	-0.033	-4.703	0.065
	(0.046)	(5.150)	(0.084)
Acqu size	-0.100***	6.461***	0.021
	(0.016)	(1.271)	(0.023)
Acqu_coll	-0.002	-10.858***	0.055
	(0.023)	(2.469)	(0.038)
Acqu_lev	0.407***	1.320	0.098
	(0.155)	(14.397)	(0.208)
Acqu_ROA	0.008	10.352	0.063

Table 30 - Results of regression analysis: Model 1, 2 and 3.

	(0.038)	(6.430)	(0.082)
Target_tech	-0.121***	11.506**	0.032
	(0.042)	(5.301)	(0.108)
Target_ROA	0.068***	-7.237***	0.173***
	(0.025)	(1.905)	(0.057)
Constant	1.004***	22.046	3.645***
	(0.275)	(29.285)	(0.457)
Observations	368	368	368
R-squared	0.242	0.276	0.142
year FE	YES	YES	YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

	(4)	(5)	(6)	(7)	(8)
VeryGreen VeryBrown	-0.060***	18.777***	17.745***	16.780***	20.232***
· _ ·	(0.016)	(2.709)	(2.687)	(2.576)	(2.798)
Relative size	× ,	` ,	-6.474***	× ,	
-			(2.173)		
Cash%			, , , , , , , , , , , , , , , , , , ,	0.078***	
				(0.023)	
Time_complete				× ,	2.864**
_ 1					(1.237)
Intra industry	0.011	-2.727	-2.191	-2.351	-2.963
_ ,	(0.022)	(1.899)	(1.878)	(1.879)	(1.885)
Cross border	0.004	7.985***	7.347***	6.689***	7.972***
-	(0.021)	(1.949)	(1.945)	(1.983)	(1.933)
Multi bid	0.010	1.491	1.661	-0.172	1.210
-	(0.031)	(3.087)	(3.076)	(3.003)	(3.112)
Acqu exp	0.022	-2.166	-2.410	-1.839	-2.344
	(0.027)	(2.094)	(2.095)	(2.063)	(2.067)
Acqu sizemed	-0.031	17.891***	16.334***	16.858***	17.627***
	(0.022)	(1.860)	(1.935)	(1.884)	(1.849)
Acqu_coll	0.005	-0.398	-0.376	0.472	-0.552
	(0.010)	(1.046)	(1.044)	(1.065)	(1.050)
Acqu lev	0.098*	2.958	4.556	1.999	2.616
	(0.056)	(5.179)	(5.271)	(4.970)	(5.255)
Acqu_ROA	-0.005	3.562	3.501	2.665	3.377
	(0.020)	(2.366)	(2.288)	(2.068)	(2.225)
Target_tech	-0.012	-1.749	-2.644	-2.717	-1.860
	(0.021)	(2.606)	(2.547)	(2.491)	(2.606)
Target_ROA	0.015	-3.160***	-2.634**	-2.533**	-3.648***
—	(0.010)	(1.183)	(1.225)	(1.239)	(1.157)
Constant	0.004	43.898***	45.141***	38.039***	33.029***
	(0.129)	(11.235)	(11.158)	(10.564)	(11.558)
Observations	368	368	368	368	368

Table 31 - Resu	lts of regression	analysis: Mode	14, 5, 6, 7 and 8.

R-squared	0.042	0.380	0.395	0.400	0.388
year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 32 - Indirect effects

	Observed coefficient	Bootstrap std. err.	Z	P>z	Normal based [95% conf. interval]	
IE 1	1.282731	.510902	2.51	0.012	.2813814	2.28408
IE 2	1.729613	.7692001	2.25	0.025	.2220087	3.237218
IE 3	-1.338829	.8330786	-1.61	0.108	-2.971633	.2939755

The table shows indirect effects of mediation analysis resulting from bootstrapping. IE 1: *very*green_*very*brown -> relative_size -> ESG performance. IE 2: *very*green_*very*brown -> cash% -> ESG performance. IE 3: *very*green_*very*brown -> time_complete -> ESG performance.

Combined, the results show that green firms do brown acquisitions. However, they do them in a specific way to mitigate the risk of reputational losses. I discuss the results in detail in the next section.

4.6. Discussion

The results of the research have several implications. Findings confirm that ESG attributes of target firms are strongly taken into account by acquiring firms in planning the acquisition, shaping their choices (Gomes, 2019). Particularly, when deals have the greatest potential for negative reputational spillovers on the acquirer (Boone and Uysal, 2020), I find that such transactions are conducted in a particular way. Indeed, the results of my study contend that, when targets with low ESG scores are involved in the acquisition, high-rated ESG acquirers leverage on the signaling nature of deal characteristics, in order to defend their ESG reputation. Specifically, I find evidence supporting that the target's relative size, the method of payment and the due diligence length, can be exploited as signals sent by acquirers. Hence, target firms of a smaller size (compared to the acquirer), the use higher percentages of

cash, and shortening the time to complete the deal after the first announcement has positive signaling effects. In line with my arguments, these findings support that acquiring firms implement acquisition strategies that allow them to reduce the strength of the signal being sent through the announcement of a 'brown' acquisition, to reinforce prior signals of ESG/CSR involvement, and to foster corrective actions in the merged entity.

The results complement prior ESG/CSR-M&A research investigating the link between ESG/CSR attributes and deal structuring (Berchicci, Dowell and King, 2012; Deng, Kang and Low, 2013; Gomes and Marsat, 2018; Gomes, 2019; Boone and Uysal, 2020b; Hawn, 2021; Ozdemir, Binesh and Erkmen, 2021) in several ways. First, it has been suggested that firms with low levels of ESG reputation tend to be pushed out of the market for corporate control (Boone and Uysal, 2020b; Barros et al., 2022), and that acquirers with ESG/CSR concerns are inclined to target firms with similar ESG/CSR activities (Krishnamurti et al., 2019a). Complementing prior research, I show that green acquirers do brown acquisitions. This might be due to the high prices of high scoring ESG firms and the increased demand in such targets. As such, firms have to balance their ESG interests with the associated costs aiming to mitigate reputational losses. Consequently, targets with a low ESG score can turn into investment opportunities, where socially responsible acquirers (with a high ESG score) take advantage from paying a lower premium, and subsequently turn around the target's ESG performance into a strong combined ESG score. Second, I find that acquirers try to control their reputation concerns by structuring these deals in a specific way. Indeed, I find evidence for the use of specific deal features, allowing them to reduce potentially negative perceptions of stakeholders with regards to 'incongruent' ESG actions, and to foster the transfer of ESG practices, thus minimizing the risks for their ESG performance.

Furthermore, this research contributes to studies investigating the impact of M&A activity on ESG performance (Tampakoudis and Anagnostopoulou, 2020a; Barros *et al.*, 2022). Indeed, by investigating the relationship between the occurrence of a brown acquisition and the acquiring firm's ESG performance after the acquisition, I find that acquirers experience a decrease in their ESG score in the year after deal completion. This is consistent with prior findings showing the positive impact of

acquiring firms with better ESG performance (Tampakoudis and Anagnostopoulou, 2020). Hence, while the acquisition of firms with superior ESG/CSR practices creates a learning opportunity for acquirers to adopt higher ESG/CSR standards (Chen, Lu and Liu, 2022), acquiring 'brown' companies worsens their ESG performance. This challenges the idea that a larger pre-deal CSR gap positively affects knowledge transfer in the post-M&A stage (Hussain and Shams, 2022). Indeed, the integration process absorbs managerial energy (Ahuja and Katila, 2001) and may not effectively result in the transfer of ESG practices to the target firm in the year following deal completion. However, the positive and significant relationship between brown acquisitions and post-M&A ESG performance in absolute terms, supports that attributes of high-ESG/CSR aware firms remain stable (McWilliams, Siegel and Wright, 2006b) and they are not scratched by the acquisition of a low-rated company. Moreover, the maintenance of a high ESG score post-acquisition is partially explained by the acquisition approaches implemented by green firms in the attempt to protect their high-ESG reputation. Particularly, I find that the target's relative size and the use of a higher proportion of cash partially mediate the positive relation with the firms' ESG performance after an acquisition. On the contrary, closing the deal faster counteracts the goal of preserving a high ESG rating. This latter effect disappears when looking at outstanding acquirers among high-rated ESG companies. This may suggest that the higher the ESG/CSR commitment of acquirers, the lower the probability that the ESG performance can be damaged by a shorter due diligence duration. Simply, high ESG/CSR ratings are associated with high standards of accountability and transparency, which in turn might also impact the evaluation and negotiation phase of an acquisition.

The results of this study have also implications for signaling theory, whose application in M&A research is valuable to better understand particular aspects of M&A deal-making (Wu, Reuer and Ragozzino, 2013b). Acquisition research has leveraged signaling theory in order to investigate, for instance, the relationship between deal characteristics and stock market reactions (Travlos, 1987; Tao *et al.*, 2017), target assessment and selection (Wu & Reuer, 2021), or stock market reactions of acquiring firms' rivals (Gaur, Malhotra and Zhu, 2013; Ranju and

Mallikarjunappa, 2019). Recent studies have emphasized that a target's ESG score constitutes a 'high-quality' signal, which reduces information asymmetry between the acquiring firm and the market (Zhang, Zhang and Yang, 2022), and between acquirers and targets (Gomes and Marsat, 2018; Ozdemir, Binesh and Erkmen, 2021; Hussaini, Rigoni and Perego, 2022). In this study, the acquisition of a 'brown' firm by a 'green' company is supposed to send an incongruent signal to stakeholders. My results suggest that, in that case, acquiring firms intentioned to carry out the operation, act as go-betweens, between the target firm and the acquirer's stakeholders, with the aim of manipulating the signal stemming from the target, before being received by stakeholders. By leveraging on the signaling power of deal features, acquirers aim to reduce the visibility of the 'acquisition signal' and, simultaneously, conveying signals consistent with their ESG/CSR attributes.

Additionally, the research brings a contribution to signaling theory in the ESG/CSR literature. Signaling theory has been highlighted as a valuable perspective to investigate ESG/CSR, as it complements other theories in economics, by associating ESG/CSR initiatives to the scenario of market failure (Zerbini, 2017), and by pointing out the cueing process that links CSR initiatives to market responses. In this vein, firms strategically leverage on ESG/CSR initiatives as market signals (Adams, Tashchian and Shore, 2001; Bansal and Hunter, 2003; Robinson, Kleffner and Bertels, 2011; Simaens and Koster, 2013). Extending this argument to the acquisition context, I introduce 'brown' acquisitions as a signal that is incongruent with a firm's ESG/CSR engagement and examine how socially responsible acquirers mitigate stakeholders' perception of an inconsistent CSR behavior. By doing so, I highlight that, by stressing CSR engagement by means of signaling instruments (i.e., deal characteristics), the negative reputational spillovers deriving from an incongruent signal, can be limited, and the acquirer's ESG performance preserved.

The study is not free from limitations, which I believe can constitute the starting point for further research on the topic. For instance, the study focuses only on variables pertaining to the pre-merger stage, which can be leveraged to retain the acquiring firm's ESG performance following M&A. Future research could move forward by investigating both qualitatively and quantitatively what factors, in the

integration phase, can explain the decrease in ESG performance experienced by green companies and what are potential moderators of the relationship. Furthermore, future work could be carried out to compare antecedents (pre-merger stage), integration approaches (post-merger stage) and outcomes of deals carried out by companies driven by different motivations underlying their ESG commitment (for example, institutional pressures, risk management, profits, mission).

4.7. Conclusions

This paper aims to investigate a largely neglected acquisition case in the green finance literature, namely the acquisition of brown companies by green companies. Specifically, I focus on how high-rated companies structure such acquisitions strategically to reduce negative spillovers and the impacts of such strategic actions on the ESG performance of the combined entity following the M&A. Drawing on signaling theory and prior ESG and M&A literature, I argue that green firms implement acquisition approaches, related to target selection, method of payment and due diligence process, that allow them to hide the signal sent to stakeholders through a brown acquisition and shape their negative perceptions, while simultaneously preparing the ground for a 'turnaround takeover' aimed to transfer ESG practices to the brown target firms. Based on a sample comprising 368 M&A deals along the period 2010-2021, the study's results reveal that green companies resort to strategies involving the acquisition of smaller target firms, the use of higher percentages of cash consideration and the speeding up of the deal completion time. By subsequently examining the effect on the acquiring ESG performance post-M&A, it emerges that, even though acquiring firms experience a deterioration in their ESG performance after the acquisition of a low-rated company, targeting companies of a smaller relative size and engaging in cash-financed deals help companies to maintain their high-ESG reputation in the year following deal completion, while carrying out a shorter due diligence process counteract their goal. In closing, I hope that this research stimulates further research activities in the field of ESG and M&A from multiple perspectives such as strategy or organizational behavior.

Chapter 5 – Conclusions

The thesis aimed to take a step in bringing together M&A and CSR research. Indeed, acquisitions and corporate social responsibility have represented, until recently, two distinct research streams. On one hand, M&A research benefits from an integration of different perspectives, as it represents a complex and disruptive event where multiple stakes are involved and implications can manifest at a micro, organizational, and macro-level. On the other hand, M&A events provide the ideal ground to test the strategic value of CSR, as they produce significant effects on shareholders' wealth. Further, sustainable development poses grand challenges that require joint efforts. In this regard, business combinations by large multinationals have the power to advance businesses' sustainable transformation. Thus, the present work represents an attempt to advance their intertwining in academia and practice, by building from existing M&A literature, to open up future development of research at the intersection of these two fields, and by filling gaps identified in extant M&A-CSR research. To this aim, the thesis developed along three studies.

In the first study, the link between innovation and M&A is addressed, and particularly, research on innovation-driven M&A is thoroughly examined by conducting an up-to-date systematic literature review. A sample of 97 academic articles is extensively reviewed and critically analyzed. First, the review work provides an analysis of articles in terms of outlets, sample characteristics, methodologies applied, theoretical backgrounds leveraged, and main themes covered. Then, a comprehensive organizing framework is developed, which can serve for future research and practitioners.

The second study links to the first one for what concerns the emphasis placed on acquisition motives. By acknowledging the scarcity of evidence on the relationship between M&A activity and a firm's sustainability performance, the impact of acquisitions driven by different underlying motives on a firm ESG performance in the long-term, is empirically tested. March (1991)'s exploration-exploitation framework is leveraged to categorize acquisition drivers, while ESG performance is measured using ESG scores provided by Thomson Reuters ASSET 4 database,

collected along the three years subsequent deal completion. Data are gathered over a sample of M&A deals completed along the period 2010-2018 by bidders located in Europe. Multiple ordinary least square regression models are used to conduct the analysis. After testing the impact of explorative and exploitative acquisitions on firms' ESG scores, the three pillar (E, S, G) are separately considered as dependent variables. Findings of the analysis support that exploration- and exploitationoriented acquisitions have a different impact on the acquiring firm's ESG performance post-acquisition. Indeed, explorative acquisitions are found to produce a notable positive impact on ESG scores in the three years following acquisition, whilst exploitative acquisitions show a negative association. By looking at the impact of M&A deals on individual ESG pillars it emerges that, in both cases, the governance is the most impacted dimension in the year following the closing of the deal. While in explorative acquisitions the positive impact of a CSR-oriented governance manifests in the enhancement of the environmental pillar, in exploitative deals the social dimension is the one that suffers most from a reduced CSR management commitment.

Differently from the second study focusing on the relationships between M&A activity and ESG performance, in the third paper, a reverse perspective is adopted. Thus, ESG attributes of the acquirer and the target firms are examined in their linkage with deal characteristics, and subsequent outcomes. To this aim, the specific case of high-rated ESG bidders acquiring low-rated ESG targets is considered, in order to investigate the management and implications of potentially valuedestroying acquisitions. Drawing on signaling theory and prior prior ESG and M&A literature, I propose that green firms implement acquisition approaches, related to the target selection, method of payment and due diligence process, that allow them to minimize and control the risk of reputational damages by reducing the potential of sending incongruent signals to stakeholders. Hypotheses are tested over a sample of 368 M&A deals completed along the period 2010-2021. Results suggest that green companies resort to strategies involving the acquisition of smaller target firms, the use of higher percentages of cash consideration and the speeding up of the deal completion time. Subsequently the impact of such strategic approaches on firms' post-acquisition ESG performance is assessed through

mediation analysis. It emerges that, even though acquirers experience a deterioration in their ESG performance after the acquisition of a low-rated company, targeting companies of a smaller relative size and engaging in cash-financed deals, help companies to maintain their high-ESG reputation in the year following deal completion, while carrying out a shorter due diligence process seems counterproductive.

5.1. Contributions

In the process, the thesis contributes to three research fields: the acquisition literature, the literature at the intersection of CSR and acquisition research, and the CSR literature. Contributions to each research stream are below synthetized.

Findings from the three studies conducted contribute to the acquisition literature in the following ways. First, over time, review works in the acquisition research field have demonstrated their fundamental importance in improving the current understanding of M&A operations, enabling academics to decrease ambiguity on causations, to reduce the complexity of the topic, and to explain the heterogeneity of performance effects. The review work proposed in the present thesis focuses on a peculiar type of acquisitions, i.e., technological acquisitions, which have increasingly gained attention in practice and academia, leading to a proliferation of studies lacking systematization. Thus, a first contribution is to provide a systematic review, a critical analysis, and a comprehensive framework to advance future research on the topic. Second, as emerged by the above systematic review work and highlighted by previous studies (Aalbers, McCarthy and Heimeriks, 2021), the consideration of acquisition motives into the analysis and an adequate operationalization of the construct represent a weak spot in the majority of acquisition studies. Nonetheless, this is crucial in order to understand the valuecreation/destruction mechanisms leading to post-merger performance and allow the generalisability of findings. Therefore, in this thesis, I handle the issue by examining announced acquisition rationales and adopting a comprehensive motive categorisation framework. Third, the thesis brings a contribution regarding M&A performance measurements, by addressing the shortage of studies that adopt

performance metrics beyond the traditional financial ones (Meglio, 2020). By measuring M&A performance along environmental, social, and governance dimensions, the thesis thus provides novel evidence on M&A outcomes for a broader range of stakeholders, including the environment. Fourth, the work extends the scope of theoretical frameworks applied in the M&A field, and particularly the signaling theory lens. In this regard, the thesis proposes a novel application of signaling theory, which departs from its prior utilization as a lens to capture mechanisms enacted and devices used in reducing information asymmetry, and supports its adoption to unveil strategies and devices leveraged by firms to reduce the power of signals and increase information asymmetry.

The contributions to the advancement of research at the intersection of acquisition and CSR fields substantiates in three main ways. First, by reviewing extant research on technological acquisitions, the thesis contributes to encouraging research on M&A and sustainability innovation. Indeed, acquisitions can be a valuable means to acquire innovative capabilities and technologies related to sustainability, but yet this is an unexplored research avenue. Second, the thesis adds to the limited line of studies investigating the link between M&A activity and sustainability performance, thus complementing prior findings on M&As as a driver for ESG performance. Third, it relates to the stream of studies investigating the relationship between ESG attributes and M&A characteristics and performance. In this respect, it brings attention to the neglected case of 'brown' acquisitions carried out by 'green' firms, giving new insights on the strategic value of CSR.

Finally, the thesis enriches extant CSR research in the following ways. It expands the literature investigating the drivers for CSR/ESG performance, since it addresses how a firm's structural changes can affect ESG performance. Additionally, while prior research has mainly investigated strategic instruments leveraged by firms to signal their CSR commitment, the thesis draws attention to the strategies implemented to mitigate stakeholders' perception of inconsistent CSR behaviours.

A summary of the thesis contributions is provided in Table 33.

5.2. Implications for theory and research

In this section the theoretical implications of each study composing this paper-based thesis are outlined.

Findings of the literature review provided in Paper 1 discover that the majority of studies on technological acquisitions have focused on targets' characteristics and integration issues, while few of them have embraced a holistic perspective that simultaneously account for target selection and integration-related considerations, in explaining technological acquisition's outcomes. Thus, the study encourages the adoption of a more integrative approach linking antecedents and outcomes by leveraging the integration phase. Additionally, a deeper consideration of the interplay between acquisition process and contextual factors is suggested, by including time-variant process variables, and controlling for internal and external contingencies. From a methodological standpoint, a finer-grained and consistent operationalization of motives, relatedness variables and M&A success metrics, is recommended to academics.

In Paper 2, the results of the analysis support the crucial role played by acquisition motives in predicting non-financial M&A outcomes. Indeed, findings reveal that, when the characteristics of acquisitions are accounted for, acquisitions have different impacts on a firm ESG performance. Although prior research concludes that M&A activity produces a positive effect on ESG performance (Barros *et al.*, 2022), the study supports that under certain circumstances, acquisitions can be detrimental for ESG commitment. Particularly, results appear to suggest that, being exploration related to the obtainment of unrelated knowledge and to the enlargement of a business horizons, explorative acquisitions foster breakthroughs innovations, a stronger stakeholder-orientation and the ability to adapt to the everchanging CSR-related expectations, benefiting ESG performance in the long term. By contrast, exploitation is suggested to work in the opposite direction, thus leading to weakened ESG performance.

Then, findings in Paper 3 strongly support that ESG attributes of the target firm are taken into account by acquiring firms and shape their choices. Particularly, when deals have the greatest potential for negative reputational spillovers, as in the case of a brown acquisition by a green company, acquiring firms carry out the acquisition in a way that allows them to reduce and control the risk of reputational damages, by minimising the sending of incongruent signals to stakeholders and strengthening the perception of prior signals indicating 'quality' and 'good intention'. Specifically, by acquiring targets of a smaller relative size and using higher percentages of cash, high-rated companies reduce the visibility of incongruent signals, send signals of trustworthiness to stakeholders, and convey to them the intention to carry out a turnaround acquisition. These acquisition strategies help acquirers to maintain their high ESG scores after the acquisition, despite a decrease of the ESG performance following a brown acquisition. Further, in the attempt to mitigate reputational losses when deal information becomes public, companies will also tend to speed up the due diligence process; however, closing the deal faster counteracts their goal of preserving their ESG rating.

5.3. Practical implications

The thesis also offers managerial implications that might be noteworthy for practitioners. First, the volume of acquisition activity in the high-technology sector suggests that managers view acquisitions as a valuable mechanism for accessing technology. It is also documented, however, that managers of acquiring firms report that only 56% of their acquisitions can be considered successful against the original objectives (Cartwright and Schoenberg, 2006). Thus, by building a holistic understanding on the antecedents, integration mechanisms and contingencies affecting M&A outcomes, the present work can serve as a guiding tool for executives in developing effective acquisition strategies resulting in successful financial and innovative outcomes. Second, managers increasingly pay attention to ESG considerations in planning their strategic decisions. The results presented indicate that the process of obtaining access to new geographical or product markets, novel technologies and capabilities from external sources, to enhance corporate ESG performance, can work. Conversely, when the acquisition is solely aimed at strengthening existing operations and building size, it can be harmful for the acquirer. This evidence may suggest that managers incur in an overexploitation error, picking acquisitions that are too closely related to their extant domains and overlooking more distant options (Levinthal and March, 1993). This 'competency trap' penalise ESG performance. Further, to avoid the externalization of costs stemming from pursuing operating and financial synergies to some categories of stakeholders (e.g., employees, communities), downsides related to governance and social dimensions have to be carefully taken into account and managed in the integration stage. The thesis also suggests that managers that give a strong socially responsible imprint to the company, enable the achievement of a durable competitive advantage, which can survive the acquisition of a low-ESG firm. However, the acquisition of a 'brown' company decreases the acquirer's ESG performance. Putting in place signaling acquisition approaches involving the acquisition of a smaller firm (compared to the acquirer), and the use of a higher proportion of cash as a method of payment, help them retaining their high-ESG reputation following deal completion. By contrast, speeding up the due diligence process to avoid negative reputational spillovers, is counterproductive.

A summary of the thesis theoretical and practical implications is provided in Table 34.

5.4. Limitations and future research

Despite the theoretical and practical contributions, the thesis is not free of theoretical and methodological limitations. Given the novelty of the topic, some of the contributions provided in this thesis offer first evidence, undoubtedly deserving further investigation by future research. Indeed, limitations concerning variables tested are here recognized. For instance, the models developed investigate acquisition outcomes in terms of ESG performance, by linking it to variables pertaining to the pre-merger stage, namely acquisition motives, pre-deal ESG performance, target size, method of payment and deal completion duration. Thus, variables related to the post-merger phase, i.e., integration-related factors, are not taken into account. Hence, a more integrative perspective can be adopted by scholars to build on and enrich the present findings. Moreover, future academic research can benefit from a greater consideration of internal and external

contingencies. For example, while in this thesis I mainly focused on the 'why' of deals and acquisition strategies, further research is encouraged to consider the 'where', e.g., the cross-border nature or the industry relatedness of deals, and the 'when' of the acquisition, e.g., the location of the acquisition in the sequence of the acquirer's M&A activity or in the firms' ESG strategic trajectory. From a methodological standpoint, empirical analyses conducted use quantitative methodologies. Despite their extensive use in M&A research, qualitative research or participant observation can represent suitable methods to better unveil the dynamics of M&A processes (Meglio and Risberg, 2010).

	Acquisition literature	M&A-CSR literature	CSR literature
Paper 1: Technological Acquisitions: A Systematic Literature Review	 Stream of research investigating the link between M&A and innovation: systematization of extant research on technological acquisitions; development of a comprehensive framework organizing studies; providing guidance for future research from a theoretical and methodological point of view 	 Stream of research investigating alternative governance modes for sustainable innovation: building on extant research on innovation-driven M&A to pave the path for research on M&A for corporate sustainability innovation 	
Paper 2: The Impact of Explorative Versus Exploitative Acquisitions on ESG Performance: An Evidence from European Acquirers	 Acquisition research linking M&A motives: drawing a distinction between the explorative vs. exploitative nature of acquisitions Acquisition research on M&A performance measurement: adoption of non-financial metrics, i.e., environmental, social, and governance dimensions, to assess post-acquisition performance 	 Stream of research investigating the link between M&A and CSR: empirically testing the impact of different motives underlying M&A activity and firm ESG performance in the long-term 	 Stream of studies on drivers of ESG performance: providing evidence of structural changes, deriving from M&A operations, as drivers/inhibitors of firm ESG performance
Paper 3: How Green Firms Hide Brown Acquisitions? A Signaling Theory Perspective	Acquisition studies applying a signaling theory perspective: - focus on how firms can reduce signals, instead of sending signals	 Stream of studies on the link between ESG attributes and M&A deals characteristics: focus on potentially value-destroying acquisitions, i.e., 'brown' acquisitions by 'green' companies 	 Stream of studies applying a signaling theory perspective: providing evidence of signaling strategies implemented to alleviate stakeholders' perceptions of inconsistent ESG practices

Table 33 - Contributions to academic research

	Theoretical implications	Practical implications
Paper 1: Technological Acquisitions: A Systematic Literature Review	 Integration of stages: adoption of an integrative approach to the investigation of the relation between antecedents and outcomes, by leveraging the integration phase Context – process interdependencies: stronger consideration of the interplay between acquisition process and contextual factors Methodological issues: motives categorization, acquirer-target technological profiles definition and measurement, consistent success metrics 	- The holistic framework provided can serve as a guiding tool for executives in developing effective acquisition strategies resulting in successful financial and innovative outcomes
Paper 2: The Impact of Explorative Versus Exploitative Acquisitions on ESG Performance: An Evidence from European Acquirers	 Linking acquisition motives to post-acquisition performance is crucial to understand value-creation/destruction mechanisms. The impact of M&A activity in driving firm ESG performance depends on the motives underlying the operation: explorative acquisitions have a positive impact, while exploitative acquisitions are negatively related to sustainability performance. 	 Explorative acquisitions bring beneficial effects for the acquiring firm's ESG performance. Exploitative acquisitions' downsides related to governance and social dimensions have to be carefully taken into account and managed in the integration stage to avoid reduced ESG performance.
Paper 3: How Green Firms Hide Brown Acquisitions? A Signaling Theory Perspective	 ESG reputation considerations affect deal characteristics. Deals involving green acquirers and brown targets are characterized by relatively smaller targets, higher percentages of cash, and a shorter time to complete. Target's relative size and cash consideration are partial complementary mediators in the relationship between the acquisition and firm ESG performance post-acquisition, while due diligence length shows a partial competing mediating effect. 	- Targeting low-scoring ESG companies of a smaller relative size and engaging in cash-financed deals help acquirers to maintain their high-ESG reputation in the year following deal completion, while carrying out a shorter due diligence process counteracts their goal.

Table 34 - Thesis theoretical and practical implications

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