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CEO Narcissism, Subsidiary Top Management Team International Diversity, and Radical Digital Innovation in Multinational Enterprises

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CEO narcissism, subsidiary top management team international diversity, and radical digital innovation in multinational enterprises

ABSTRACT

Drawing on the extended agency model of narcissism and upper echelons theory, we develop a theoretical framework that examines the interface between chief executive officers (CEOs) and foreign subsidiary top management teams (TMTs) and the radical digital innovation of multinational enterprises (MNEs). We posit that CEO narcissism and the international diversity of foreign subsidiaries' TMTs positively influence an MNE's radical digital innovation. However, we also argue that this international diversity of foreign subsidiaries' TMTs weakens the influence of CEO narcissism on radical digital innovation. These hypotheses gain support from empirical analyses of a sample of 3,064 firm-year observations comprising 769 CEOs from 347 South Korean MNEs between 2011 and 2020. Our findings underscore the importance of CEO personality traits, i.e. narcissism, and TMT composition, i.e. international diversity, at the intersection between strategic leadership and radical digital innovation.

Keywords: CEO narcissism; radical digital innovation; subsidiary top management team international diversity; multinational enterprises; South Korea

JEL Code: M1; M12; M14; M15; M16

1. Introduction

A growing body of research has examined the relationship between chief executive officer (CEO) narcissism and firms' strategic risk-taking (Braun, 2017; Cragun et al., 2020; Grijalva et al., 2015; Lee et al., 2023). Narcissistic CEOs have a "multifaceted personality trait that combines grandiosity, attention seeking, an unrealistically inflated self-view, a need for that self-view to be continuously reinforced through self-regulation, and a general lack of regard for others" (Cragun et al., 2020: 909). Previous studies suggest that CEO narcissism can positively influence innovation; because narcissistic CEOs are drawn to bold, risky actions that satisfy their belief in their superior ability and judgment and their need for intense, continuous attention, admiration, and appraisal (Kraft, 2022; Steinberg et al., 2022). However, existing research often overlooks distinct types of innovation. This oversight has led to inconsistent findings. Notably, few studies have explicitly examined radical innovation, except for Kashmiri et al. (2017). In line with the Schumpeterian perspective on innovation (Drejer, 2004; Schumpeter, 1942), we define radical innovation as the development of breakthrough technologies that significantly change how products and services are used and experienced. These significant changes require leaders who possess a bold vision and a high tolerance for the risks and uncertainties inherent in pioneering efforts, qualities that are quintessentially aligned with the traits commonly associated with narcissistic CEOs (Kashmiri et al., 2017; Kobarg et al., 2019; Slater et al., 2014).

Narcissistic CEOs and their subjective judgments are particularly salient to multinational enterprises' (MNEs) radical innovation because of "the cross-border informational limits and reliability constraints that occur as the firm becomes increasingly international" (Georgakakis et al., 2023: 515). These restrictions affect how managers obtain and process information and make efforts with "good on open-ended promises" (Kano and Verbeke, 2019: 120). This is further compounded by the international diversity of foreign subsidiaries' top management teams (TMTs) (subsidiary TMT international diversity hereafter). As indicated by the CEO-TMT interface literature, strategic leadership is a collective process constructed through the interactions between the CEO and the TMT underpinning the firm's strategies (Georgakakis et al., 2022; Junge et al., 2024; Simsek et al., 2018). Their relationship within MNEs is particularly complex due to the presence of foreign subsidiaries that operate in diverse political, legal, economic and cultural environments (Ambos et al., 2020; Hoenen and Kostova, 2015; Meyer et al., 2020). Consequently, corporate CEOs and foreign subsidiary TMTs must navigate a fragmented information landscape characterized by the sheer volume and complexity of data. Their dynamics further complicate decision-making processes because of power and information asymmetries (Georgakakis et al., 2023). In this context, subsidiary TMT international diversity may either enhance the potency of narcissistic CEOs in strategic decision-making or dampen it.

However, while the interaction between corporate CEOs and foreign subsidiary TMTs plays a critical role in driving MNEs forward (Cuypers et al., 2022; Georgakakis et al., 2023; Ponomareva et al., 2022), existing research offers little insight into their combined impact on radical innovation. Similarly, studies on CEO narcissism in the context of MNEs remain scarce, with Lee et al. (2023) being an exception. Furthermore, no research has yet explored the combined effects of CEO narcissism and TMT international diversity on innovation, despite their individual effects having been examined (Belderbos et al., 2022; Boone et al., 2019; Lakshman and Gonzalez, 2023; Ponomareva et al., 2022). Yet, subsidiaries have shown increasing influences on MNEs' corporate strategies including those related to innovation (Cuervo-Cazurra et al., 2019; Mudambi and Navarra, 2004), and the diverse background of subsidiary managers shapes their decision-making that may potentially affect CEOs in headquarters (Belderbos et al., 2022; Nielsen and Nielsen, 2013). Thus, it is important to examine the combined effects, rather than focusing only on their individual effects.

In this study, we integrate insights from the extended agency model of narcissism (Campbell and Foster, 2007) and upper echelons theory (Hambrick, 2007; Hambrick and Mason, 1984) into a theoretical framework that links the CEO-TMT interface with radical innovation in MNEs. Our study is motivated by mixed findings on the CEO narcissism-innovation relationship, the unique organizational context of MNEs, and the overlooked interplay between CEO narcissism and TMT international diversity in driving radical innovation. Specifically, we propose that CEO narcissism and subsidiary TMT international diversity are positively related to MNEs' radical innovation. However, we contend that the preference of narcissistic CEOs for radical innovation weakens if an MNE's foreign subsidiaries have a higher level of TMT international diversity. We focus on radical digital innovation (i.e., digital transformation-related technology development) as a specific form of innovation not least because this is arguably the most important form of innovation that provides competitive advantages for firms in the intensifying global competition (Lee et al, 2023). Moreover, our research context is Korean MNEs, many of which have been the leading firms in digital innovations (Lee, 2019).

While scholars in the past often posit that narcissism is more prevalent in individualistic cultures (e.g., the US, Europe, and Oceania), recent research (e.g., Fatouta et al., 2021) has revealed that individuals in collectivistic cultures, such as Asia and Africa, report higher scores on some specific narcissism dimensions, for example, grandiose exhibitionism, than those in individualistic cultures. Existing research has indicated that Korean narcissistic CEOs have had a profound influence on corporate activities (Kang and Cho, 2020; Lee et al., 2023; Yoo, 2016). This relates to the socio-cultural factors prominent in Korea, as well as in other Asian countries such as China, Singapore, and Malaysia (Hofstede et al., 2010). First, the Korean hierarchical social structure

emphasizes status and power—indicators of social standing to which, according to research in the field of psychology and organizational behavior, narcissists are reactive (Braun, 2017; Fatfouta, 2019; Jauk et al., 2017). Second, there are strong societal pressures to succeed in Korea, which encourages narcissistic traits to stand out and gain recognition. Third, Yook and Lee (2020: 1710) note, "Korean culture places critical importance on protecting public image and avoiding shame and embarrassment;" this may produce a desire for admiration and a focus on self-promotion and self-enhancement—also traits associated with narcissism.

However, Korean narcissistic CEOs also face the challenge of cultural norms related to collectivism, which emphasize harmony, modesty, and norms of reciprocity. Navigating the interplay between their personality traits and societal expectations, Korean CEOs must balance their self-promotion behaviors and desire for personal recognition with the group's success and harmony within the MNE network, including headquarters and foreign subsidiaries. Consequently, the Korean business landscape epitomizes a milieu wherein the predilections and volition of the senior leadership significantly influence a firm's strategic direction, including its innovation and internationalization. Therefore, it is highly pertinent to examine the link between firms' radical innovation strategies, the narcissistic tendencies of their CEOs, and the boundary conditions of their TMTs in the context of Korean MNEs.

We conduct our empirical analysis using a longitudinal panel dataset comprising of 3,064 firmyear observations, which include 347 Korean MNEs and 769 CEOs spanning the 2011-2020 period. Our study makes important theoretical contributions by incorporating MNEs' radical innovation, CEO narcissism, and subsidiary TMT international diversity into a unified framework to unite the research streams of innovation, strategic leadership, and international business (IB). Specifically, our theoretical model provides a new perspective on the intersection between innovation and strategic leadership research (Kurzhals et al., 2020). Drawing on the extended agency model of narcissism (Campbell and Foster, 2007) and upper echelons theory (Carpenter et al., 2004; Hambrick, 2007; Hambrick and Mason, 1984), we theorize about the interplay between narcissistic CEOs and subsidiary TMTs and propose positive effects of CEO narcissism and subsidiary TMT international diversity on radical innovation; furthermore, we suggest that subsidiary TMT international diversity is a novel moderating mechanism that attenuates the effects of CEO narcissism.

We extend the emerging research on CEO narcissism (Cragun et al., 2020), which has paid limited attention to MNEs and radical innovation. As MNEs face complex and multifaceted international environments, CEOs and TMTs are challenged to make rational decisions (Belderbos et al., 2022; Hsu et al., 2013; Nuruzzaman et al., 2019; Ponomareva et al., 2022). Radical innovation presents a plethora of unique opportunities for narcissistic CEOs to attract attention,

admiration, and appraisal by demonstrating their grandiose visions and making bold, confident, and competent appearances. However, our findings show that subsidiary TMT international diversity can weaken the influence of CEO narcissism on radical innovation, preventing MNEs from veering toward suboptimal radical innovation. A reason is that subsidiary TMTs are crucial channels for diverse information sources (Hutzschenreuter and Matt, 2017; Kim et al., 2022) and can process information for radical innovation (Henderson and Clark, 1990; Kogut and Zander, 1992). More importantly, subsidiaries are centers for creating and transferring knowledge in the MNE network rather than passive recipients of headquarters' knowledge (Belderbos et al., 2022; Kostova et al., 2016; Nuruzzaman et al., 2019). Therefore, responding to calls by Cragun et al. (2020) and Kraft (2022) to explore TMT-related factors as boundary conditions shaping the effects of CEO narcissism on organizations, and that by Cuypers et al. (2022) to shift the analytical focus from the predominantly studied headquarters-level TMTs to the often-overlooked subsidiary-level TMTs, our study complements the existing research by highlighting subsidiary TMTs as an intervening mechanism that moderates the impact of CEO narcissism within the MNE context.

2. Theory and hypotheses development

2.1. Radical digital innovation in MNEs

Radical innovation aims to create new markets and technologies as well as transform existing ones by giving them new or drastically improved features (Leifer et al., 2001). Such innovation requires not only novel ideas or technological advances but also (and more importantly) non-traditional managerial approaches that depart from established organizational practices (Burgelman, 1985; Urban and Hauser, 1993). High degrees of uncertainty, risk, and cost are inherently embedded in the procedures and processes of radical innovation, in which firms must accept high unpredictability in economic returns. Radical innovation often necessitates substantial long-term resource commitment, promising significant rewards if successful but entailing considerable losses if unsuccessful. Therefore, the initiation and continuation of radical innovation projects hinge on having patrons in leadership positions who "[r]ather than base decisions on promises of specific economic payback hurdles, commonly cited continued investment based on *a gut feel* that the project could have [a] significant impact on the long-term success of the firm" (McDermott and O'Connor, 2002: 432). Of particular recent interest is the emergence of radical digital innovation, which has leveraged cutting-edge digital technologies such as artificial intelligence (AI), blockchain, and the Internet of Things (IoT) to fundamentally change business models, operational processes, and market offerings. Different from traditional radical innovation (Drejer, 2004), radical digital innovation has established a highly interrelated ecosystem in which firms must adapt to rapid technological shifts and changing markets. Such radical innovation is particularly important in the context of MNEs, because they operate across diverse institutional environments and market dynamics, where digital transformation-related technology development can facilitate cross-border knowledge integration and create novel values (Berman and Marshall, 2014). Despite this, potential challenges of radical digital innovation may require MNEs to balance needs and demands across countries where their subsidiaries are located (Ekman et al., 2020). Thus, MNEs have to manage resource commitment and strategic leadership in line with changes resulting from radical digital innovation.

2.2. Digital transformation-related technology development as an exemplification of radical digital innovation

We adopt a Schumpeterian perspective on radical innovation, focusing on breakthrough technologies that induce profound changes in how products and services are used and experienced (Drejer, 2004; Schumpeter, 1942). These innovations disrupt the prevailing status quo by introducing unprecedented products, pioneering production methodologies, penetrating untapped markets, and establishing novel intermediaries, among other significant shifts (Tidd and Bessant, 2013; Schumpeter, 1934). Therefore, it could be overly simplistic to limit a firm's endeavors in radical innovation to product or technology changes alone. Instead, such efforts could be reconceived as broader adaptations to the rapidly evolving business landscape, signifying a deeper, strategic approach to innovation.

Digital transformation is conceptualized distinctly across various domains, including academia, industry, and non-governmental organizations (see Table 2). Nevertheless, common among these interpretations is the understanding that digital transformation is not confined to a singular technology or process and can be viewed as an overarching concept encapsulating a range of changes precipitated by digital technologies. This perspective considers digital transformation as a

comprehensive revolution that is reshaping values across industries and societies, altering all facets of life by fundamentally redefining organizations' business-related activities through digital means (Berman and Marshall, 2014; Rogers, 2016; van Meeteren et al., 2022). Consequently, from an MNE's standpoint, it is imperative to identify the necessary technologies for digital transformation, understand their attributes, and ascertain their impact on internationalization and operations (Feliciano-Cestero et al., 2023). Our content analysis provides further evidence of the fundamental association between digital transformation-related technologies and radical innovation (Appendix 2).

Insert Table 2 about here

Against this backdrop, digital transformation and the associated technology development have seen a particularly radical shift within Korean MNEs, especially those lagging in core software and digital technologies. Digital transformation denotes the assimilation of digital technologies across all organizational facets, culminating in a foundational shift in operational modalities and value proposition mechanisms (Hanelt et al., 2021). Digital transformation in the IB context is unique because it involves the development of technologies across multiple markets, which significantly influences the way MNEs strategize and operate (Ekman et al., 2020). Unlike firms operating in a single-country context, MNEs must coordinate geographically dispersed subsidiaries, often involving diverse regulatory, market, and technological environments. Occupying high-tech sectors yet vulnerable in these crucial knowledge domains, Korean MNEs are being compelled to enact radical and swift adaptation.

2.3. Strategic leadership and radical digital innovation

Strategic leadership refers to "the functions performed by individuals at the top levels of an organization that are intended to have strategic consequences for the firm" (Samimi et al., 2022: 3). The research has underscored the pivotal roles of strategic leaders, particularly CEOs, TMTs, the board of directors (BOD), and other C-suite members (e.g., chief financial officer, chief information officer, and chief operating officer). This literature examines the characteristics, actions, decision-making processes, and impacts of strategic leaders on organizational strategies and outcomes (Boal and Hooijberg, 2000; Cortes and Herrmann, 2021; Georgakakis et al. 2023; Kurzhals et al., 2020; Luciano et al., 2020; Simsek et al., 2018; Singh et al., 2023; Van Doorn et al., 2022). A main assertion of this research is that strategic leaders crucially influence an organization's trajectory, guiding it toward long-term objectives and success (Hambrick, 2007; Hambrick and Fukutomi, 1991; Hambrick and Mason, 1984). Given the strong association between innovation and the

organization's major strategic direction, the influence of strategic leadership on innovation-related decision-making has garnered considerable scholarly attention. Studies have examined various dimensions ranging from idea generation, elaboration, and championing to implementation and from innovation input through R&D investment to innovation output in the form of patents and the introduction of new products, services, or processes (Cortes and Herrmann, 2021; Kurzhals et al., 2020; Samimi et al., 2022).

Extensive studies in this vein underscore the pivotal role of strategic leadership in fostering radical innovation (Mom et al., 2009; O'Connor, 2008; O'Reilly III and Tushman, 2004; Tushman and O'Reilly, 1996; Vaccaro et al., 2012). CEOs and TMTs often wield significant leadership power, emphasizing the importance of radical innovation to their organizations (Miles, 2007). Existing studies have examined the influence of top managers' characteristics on radical innovation. For example, Strese et al. (2018) suggest that a CEO's passion for innovation drives radical changes. Xue et al. (2024) find that the technical career background of CEOs strengthens the inverted U-shaped relationship between M&A intensity and radical innovation. Yang et al. (2023) reveal the positive effects of TMTs' technical orientation on radical innovation capability. Kruse et al. (2023) argue that CEOs' decision-making styles impact the radicalness of new product development. Additionally, Sharp et al. (2017) propose that the radicalness of inventions is negatively associated with TMT age and tenure but positively related to TMT functional diversity. Despite these insights, existing studies have largely examined CEOs and TMTs separately, with limited attention to the CEO-TMT interface in shaping radical innovation decisions. We address this issue by focusing on CEO narcissism and its interaction with subsidiary TMT international diversity.

2.4. CEO narcissism and radical innovation

There are two types of narcissism: grandiose and vulnerable narcissism, which differ significantly, despite the common cores of self-importance and entitlement in them (Jauk et al., 2017). Grandiose narcissists have inflated self-views, crave affirming recognition, and engage in bold attention-seeking behaviors. By contrast, vulnerable narcissists tend to exhibit anxiety, emotional instability, and fragile self-esteem, albeit with hidden feelings of grandiosity. Grandiose narcissism is considered to affect organizations and people critically, and this narcissistic disposition is a key driving force behind the pursuit of a leadership position, whereas traits associated with vulnerable narcissism seem counterproductive in a leadership role (Campbell and Campbell, 2009; Fatfouta, 2019; Grijalva et al., 2015). Therefore, grandiose narcissists are more prevalent at the leadership level, and the leadership literature has largely focused on grandiose narcissists (Braun, 2017; Campbell et al., 2011; Fatfouta, 2019). Accordingly, we focus on the

grandiose narcissism of CEOs.

Our review of the literature (see Table 1) shows that the dynamics of CEO narcissism and innovation have been scrutinized across diverse contexts, encompassing firm types, specialized industrial sectors, and countries. The majority of prior research has indicated that narcissistic CEOs lean toward innovation, albeit with different preferences regarding explorative vs. exploitative innovation (Steinberg et al., 2022) or innovation ambidexterity (i.e., a balance between explorative and exploitative innovation; You et al., 2023).

Insert Table 1 about here

In this study, we apply the extended agency model of narcissism (Campbell and Foster, 2007) in response to Cragun et al.'s (2020) call to understand CEO narcissism through the lens of personality theory while addressing the principle–agency dynamics within MNEs (Hoenen and Kostova, 2015). This model's principal premise is that narcissistic self-enhancement is more evident in domains involving agency or agentic concerns (e.g., power, status, and extraversion) and that narcissism works as a self-regulatory system that constructs, maintains, and enhances the narcissist's overbearing self-view. The characteristics of CEO narcissism work as both a cognitive frame and a motivational mechanism to influence CEOs' strategic decision-making on radical innovation (Chatterjee and Hambrick, 2007). As the agents of MNEs, the CEOs' cognitive aspect of narcissism suggests that their narcissistic decision-making prioritizes the achievement of two self-serving needs ("the need for acclaim and the need to dominate others") over the financial interests of their organization (Chatterjee and Pollock, 2017: 703). They thus actively align their organizations' strategic choices with their quest for originality, novelty, and supremeness—all of which are key features of radical innovation (O'Reilly and Chatman, 2020).

Narcissistic CEOs are highly alert to new and exciting developments. Their excessive selfconfidence in their leadership abilities and strong belief in the superiority of their judgment drives them to systematically overestimate potential payoffs (Campbell et al., 2011; O'Reilly and Chatman, 2020). They are thus more likely to become patrons of radical innovation projects, propelling their entire organizations (e.g., MNEs and their subsidiaries) to cognitively focus on radical innovation through their grandiose visions and bold, confident, and competent appearance (Gerstner et al., 2013; O'Reilly and Chatman, 2020). Rather than passively responding to other people's actions, they strive to proactively create future directions (Davis, 1987), such as by demonstrating support for new trials (Hamel and Prahalad, 1996). While less narcissistic CEOs consider radical innovation too risky, narcissistic CEOs' grandiose sense of self-confidence and self-belief drives them to make risky and radical innovation decisions. In the MNE context, CEOs have control, power, and influence not only with headquarters but also with foreign subsidiaries (Georgakakis et al., 2023). Narcissistic CEOs, therefore, have a larger platform for radical innovation. Empowered by a global reach, ample resources, and reduced immediate accountability, narcissistic CEOs' cognitive biases may lead them to perceive radical innovation as signifying greater opportunities that can be exploited in multiple markets. They may also seek information that confirms their ideas while ignoring dissent and differing opinions, dismissing contradictory evidence, and underestimating the probability and size of negative outcomes (Engelen et al., 2016; Kashmiri et al., 2017; Lee et al., 2023).

Regarding motivation, narcissism drives self-enhancement (i.e., the desire to increase or maintain the positivity of the self; Campbell et al., 2011). Sponsoring radical innovation feeds narcissistic CEOs' desire for self-enhancement. Like other CEOs, narcissistic CEOs estimate the payoffs of radical innovation based on market value and profitability. Unlike other CEOs, even when the innovative outcomes are not yet known, narcissistic CEOs factor in the awe and admiration they will receive from the public, industry peers, and the press for their bold visions and daring actions (Gerstner et al., 2013). Furthermore, the radical innovation decisions of narcissistic CEOs are subject to bounded rationality (i.e., the limited ability to obtain and process complete information, Georgakakis et al., 2015) as these decisions are significantly based on partial or incomplete information and gut feelings (Campbell et al., 2011; Rovelli et al., 2023; Zhang et al., 2017). This is particularly salient in the context of MNEs, where CEOs face a multifaceted information environment (Georgakakis et al., 2023). Therefore, radical innovation decisions can follow from narcissistic CEOs' motivation to take bold, risky actions that draw audience attention, admiration, and appraisal (Engelen et al., 2016; Hoskisson et al., 2017; Kashmiri et al., 2017). The expansive platform of MNEs, encompassing both headquarters and subsidiaries, allows these CEOs, through their radical innovation decisions, to assert their superiority and validate their selfperception as visionary leaders. Accordingly, CEO narcissism is expected to facilitate MNEs' radical innovation.

Building on this overarching tendency, and specifically drawing on arguments developed through the extended agency model of narcissism (Campbell and Foster, 2007) and the CEO narcissism literature, we propose the following hypothesis:

Hypothesis 1 (H1). CEO narcissism positively influences MNEs' radical digital innovation.

2.5. Subsidiary TMT international diversity and radical digital innovation

In addition to CEOs at MNE headquarters, foreign subsidiary TMTs—comprising high-ranking executives—can also affect the radical digital innovation of MNEs, both directly and indirectly. Prior research has shown that TMTs are fully responsible for their organizational performance

(Hambrick and Mason, 1984; Nielsen, 2010), and the leadership of a foreign subsidiary is often shared with headquarters through, for example, expatriation (Ahrens et al., 2018). While some decisions are made at the MNE headquarters, corporate strategies are increasingly being influenced by subsidiaries with bargaining power in local markets because they can develop and control strategic resources that are of value to their MNE's network (Cuervo-Cazurra et al., 2019; Mudambi and Navarra, 2004). This is particularly significant when it comes to corporate innovation strategies. Subsidiaries are no longer merely passive recipients of headquarters' knowledge but have become important power centers of knowledge creation and reverse knowledge transfer (Belderbos et al., 2022; Kostova et al., 2016; Nuruzzaman et al., 2019). This makes subsidiary TMTs instrumental in corporate innovation strategy.

Previous studies have shown that TMT diversity, defined as the degree to which a TMT is heterogeneous with respect to its different attributes, e.g., demographic, educational, professional, social, and cultural backgrounds (Harrison and Klein, 2007; Krause et al., 2022; Kurzhals et al., 2020; Nielsen, 2010), contributes significantly to innovation as well as other proactive strategic decisions that require novelty (see the review by Miller et al., 2022). Considering our research context of MNEs, we highlight the international diversity of foreign subsidiaries' TMTs, particularly focusing on their nationality diversity, in line with the literature (e.g., Belderbos et al., 2022; Boone et al., 2019; Nielsen and Nielsen, 2011, 2013).

Existing research has established that an executive's national background shapes their decision-making because it can affect their development of schemas, cognition, and values and give them in-depth knowledge about institutions, norms, and markets (Belderbos et al., 2022; Hambrick et al., 1998; Nielsen and Nielsen, 2013). However, in their comprehensive review of the nexus between strategic leadership and innovation, Kurzhals et al. (2020) find that existing studies have largely focused on demographic, educational, and industrial backgrounds, paying little attention to TMTs' international backgrounds. Yet, in a globally networked MNE, subsidiary TMTs are internationally diverse, demonstrating team heterogeneity and imbuing the subsidiary level with distinct information, knowledge, experience, and skill sets (Hambrick et al., 1996). Together, they form a unique team identity by establishing a shared understanding of what it means to be a group, seeking out unshared information to limit the bias toward shared information, and increasing the rigor and extensiveness of information analysis (Dahlin et al., 2005; Van Doorn et al., 2022).

The effect of subsidiary TMT diversity is particularly significant in MNEs from certain countries such as South Korea (Korea, hereafter), where headquarters TMT members are mainly Korean males in their 50s, but foreign subsidiary TMTs are internationally diverse. The two groups are subject to different incentives and enticements, leading to different kinds of behavior. Subsidiary TMT members exhibit greater role conflict and ambiguity and higher degrees of

interdependence. In the context of radical innovation, we propose that subsidiary TMT international diversity directly facilitates radical innovation for three reasons.

First, the international diversity of subsidiary TMTs serves as an MNE's channel to globally diverse information sources. This refers to subsidiary TMTs serving as pathways that allow different types of knowledge to flow and intersect. Past studies have found that subsidiary TMTs can access knowledge stock in foreign countries (Hutzschenreuter and Matt, 2017; Kim et al., 2022), which is essential for radical innovation since radically developing new technologies requires novel insights that are distant from the existing knowledge base (McDermott and O'Connor, 2002; Slater et al., 2014). Thus, TMTs working in the globally dispersed network of an MNE's subsidiaries play an important role in developing the MNE's competitiveness as they can access various local information in the subsidiaries' host countries (Cuypers et al., 2022; Santangelo, 2012). Besides the host countries, these TMTs also expand their MNE's network into new foreign locations to develop connections between the MNE and information sources outside the subsidiaries' locations (Najafi-Tavani et al., 2014). Thus, having a diverse cohort of subsidiary TMTs enables an MNE to access diverse information sources, collectively weaving a rich tapestry of knowledge that will help it identify feasible radical innovation strategies and locate best practices for such activities.

In addition to being a conduit for global information and foreign knowledge, subsidiary TMTs *per se* are knowledge sources for an MNE's radical innovation, because these executives individually hold distinct knowledge (Ambos et al., 2006) and have directly accumulated significant experience and knowledge of foreign countries (Nuruzzaman et al., 2019). Their knowledge enables MNEs to make long-term resource commitments to radical innovation, which can involve ill-defined and novel problem-solving efforts that require significant expertise and complementary knowledge (McDermott and O'Connor, 2002: 432). As a cohort, subsidiary TMTs, as sources of different knowledge and expertise, provide rich information about foreign technologies and global innovation trends, contributing to "increasingly globally dispersed knowledge pools, emergent technologies, and specialized expertise" (Boone et al., 2019: 279) and co-designing the innovation strategies of MNEs (Meyer et al., 2020; Talke et al., 2010). The diversity and breadth of their knowledge inputs required for radical innovation. Thus, internationally diverse subsidiary TMTs enable MNEs to efficiently process innovation-specific resources and smoothly manage the procedure for radical innovation.

Furthermore, internationally diverse TMTs process and recombine information and knowledge in ways that enhance the strategic preferences for radical innovation. Prior research has argued that innovation is rooted in the recombination of information and existing knowledge into new

knowledge via novel approaches (Henderson and Clark, 1990; Kogut and Zander, 1992). Meanwhile, upper echelons theory posits that the cognitive structures of TMT members influence how they interpret and act on information concerning the competitive IB environment in which they operate (Hambrick, 2007; Hambrick and Mason, 1984). In foreign subsidiaries, TMTs with diverse international backgrounds can "rapidly retrieve complex configurations of information from longterm memory" (Rost and Osterloh, 2010: 215). These executives have varying orientations toward managerial decisions and organizational strategies (Belderbos et al., 2022; Boone et al., 2019; Gong, 2006). Collectively, they can develop novel orientations for innovation (Tihanyi et al., 2000) and global strategic positions (Carpenter and Fredrickson, 2001).

Prior research has shown that TMT international diversity makes MNEs more sensitive to foreign environments and reconciles the conflicts and paradoxes that emerge during radical innovation processes (Nielsen and Nielsen, 2011). When executives view innovation from their diverse perspectives and recombine the knowledge gained through different cognitive approaches, novel solutions can be proposed and implemented to address the uncertainties, risks, and costs associated with radical innovation (Mom et al., 2009; Vaccaro et al., 2012). Their debates can further stimulate creative thinking and novel linkages, thereby enhancing radical innovation (Mehrabi et al., 2021). Thus, we posit a direct influence of subsidiary TMTs on the radical innovation of MNEs:

Hypothesis 2 (H2). Subsidiary TMT international diversity positively influences MNEs' radical digital innovation.

2.6. The interface between CEO narcissism and subsidiary TMT international diversity

In addition to the direct and positive impact of subsidiary TMT international diversity on MNEs' radical innovation, we expect subsidiary TMTs to alleviate the impact of CEO narcissism on MNEs' radical innovation by reducing the potency of narcissistic CEOs. This alleviation effect is underpinned by two mechanisms. One is that subsidiary TMTs can influence corporate CEOs by presenting persuasive arguments, and they may even keep them at bay by challenging their power through coordinating with the board of directors and engaging in contestation processes that trigger CEO turnover and dismissal (Georgakakis et al., 2023; Kostova et al., 2016; Simsek et al., 2018; Van Doorn et al., 2022). The other mechanism is that the collective cognition, capabilities, and interactions of subsidiary TMTs can intersect with those of corporate CEOs, and such intersecting activities shape how a narcissistic CEO can take action (Hambrick, 2007; Pisani et al., 2018; Talke et al., 2010).

Specifically, subsidiary TMTs, differing from corporate TMTs, work interdependently with corporate CEOs in that they are bound together internally on corporate strategies and externally in

the broader managerial labor market (Simsek et al., 2018). They comprise a mix of local talents and expatriates who are often recruited from different labor markets and can work both interdependently with and independently from the CEO at the headquarters (Luciano et al., 2020). This is because these TMTs are responsible for subsidiaries that are not "merely geographically dispersed agents of the MNE" but rather "internally differentiated and goal-disparate units with their own external stakeholder networks" (Kostova et al., 2016: 179). Within the power and politics of MNEs, foreign subsidiary TMTs need to negotiate with corporate CEOs, and even challenge their power, to mitigate the bounded rationality in the latter's enactment of the innovation leadership role and to ensure that their own subsidiaries' interests are protected (Georgakakis et al., 2023; Geppert and Dörrenbächer, 2014; Van Doorn et al., 2022). This can occur even within MNEs from countries characterized by high power distance culture.

For instance, Ambos et al. (2020) present an inductive qualitative study of four headquarters– subsidiary relationships in a Latin American multinational hybrid organization, where Latin American countries are generally considered to have high-power distance culture. Ambos et al. (2020) provide concrete examples of subsidiary TMTs in negotiation with headquarters, indicating that they challenge corporate CEOs. Likewise, Keum (2023) explores managerial political power within the Samsung Group, illustrating instances where managers have influenced or challenged CEOs. When interacting with narcissistic CEOs, subsidiary TMT international diversity, as a conduit for global information and foreign knowledge, helps to ensure that ample information is brought to the table when making critical strategic choices, leading to more informed decisions on radical innovation. Diversified subsidiary TMTs, comprising individuals with specialized knowledge and expertise, are hereby more likely to work both interdependently and independently, preventing narcissistic CEOs from making hasty radical innovation decisions (Luciano et al., 2020).

In developing radical innovation, reaching a consensus on relevant strategies is crucial (Kobarg et al., 2019), but internationally diverse subsidiary TMTs may neither agree with narcissistic CEOs' opinions nor compromise them (Meyer et al., 2020). These subsidiary executives undertake "deliberative-integration decision-making" (i.e., a combination of slower decision-making speed and higher behavioral integration; Bachrach et al., 2023) because they hold significantly varying views shaped by their distinct backgrounds and experiences. They must conduct proper discussions, debates, and negotiations among themselves and with corporate CEOs to reach a consensus on radical innovation decisions (Priem, 1990). When internationally diverse subsidiary TMTs bring various perspectives and knowledge sources to headquarters, narcissistic CEOs' information processing will affect their self-serving needs in radical innovation.

Prior research has shown that a broad scope of knowledge sources brings conflicting information (Pfeffer, 1983). The large volume of, albeit sometimes inconsistent, information from

internationally diverse TMTs increases the costs and burden of information processing by narcissistic CEOs and introduces information bias (Ancona and Caldwell, 1992; Chatterjee and Pollock, 2017). As subsidiary TMTs inform narcissistic CEOs of the pros and cons associated with radical innovation proposals, under consideration of the latter's tendency to seek attention and admiration and the need to avoid criticism that would threaten their egos and narcissism supply (Byun and Al-Shammari, 2021), narcissistic CEOs may moderate their actions and become more rational rather than rushing into decisions on radical innovation. Put differently, although narcissistic CEOs' predominant goal is to establish dominance and superiority, they also need admirers and supporters, not critics. Subsidiary TMT international diversity thus weakens narcissistic CEOs' self-enhancement-driven striving for radical innovation, as the working relationships between corporate CEOs and their subsidiary TMTs mean that narcissistic CEOs employ their self-regulatory system and associated tactics to stave off perceived threats (Campbell and Campbell, 2009). We, therefore, propose a moderating effect of subsidiary TMTs:

Hypothesis 3 (H3). Greater international diversity in subsidiary TMTs weakens the positive effect of CEO narcissism on MNEs' radical digital innovation.

3. Context, data and methodology

3.1. The context of South Korea and Korean MNEs

Context matters for strategic leadership research, as it enhances rigor and relevance (Teagarden et al., 2018) and reveals the connections and complexities within which MNEs operate (Dau et al., 2022). Our research context is Korean MNEs. South Korea is notable for its rapid economic catchup through innovation (Lee, 2019; Mahmood and Singh, 2003), giving Korean firms a competitive advantage when internationalizing (Lee et al., 2023). Korean MNEs have thus evolved into formidable players in the IB arena, driven predominantly by their aggressive investment in innovation (Kim, 1997; Lee, 2019). Examples are abundant. Samsung and LG have revolutionized the technology of digital displays (e.g., organic light-emitting diodes and quantum-dot light-emitting diodes), setting new standards in the consumer electronics industry and establishing foreign subsidiaries to advance such technologies globally. Similarly, Hyundai and Kia have developed autonomous vehicle technologies, pushing the technological boundaries of the automotive industry, while SK Innovation's contributions to lithium-ion battery technology have facilitated the global proliferation of electric vehicles.

3.2. Data and sample

We test our hypotheses on a longitudinal panel dataset of 3,064 firm-year observations comprising 347 MNEs publicly listed on the Korea Stock Exchange (KSE). These firms undertook

foreign direct investment (FDI) between 2011 and 2020. Data were collected from multiple sources, including (1) financial and accounting information from KISLINE and KISVALUE; (2) FDI information from the Korean Ministry of Economy and Finance (KMOEF) and Export-Import Bank of Korea (Korea Eximbank) databases and the Korea Listed Companies Association (KLCA); and (3) each firm's annual reports in the Data Analysis, Retrieval, and Transfer (DART) system provided by the Korean Financial Supervisory Service (KFSS).

To collect data on CEO narcissism, we identified information about the CEOs of Korean MNEs from (1) the Korea Listed Companies Management Directory from the KLCA, (2) KISLINE from the Korea Investors Service, (3) *Maekyung* Company Yearbooks from *the Maeil Business Newspaper*, (4) each firm's annual reports, and (5) each CEO's interview records. The interviews were conducted by journalists or financial analysts, and the interview transcripts were provided by Korean news media companies, including *The Chosun Ilbo*, *Dong-A Ilbo*, *JoongAng Ilbo*, *Hankook-Ilbo*, *Hankyoreh*, *Kyunghyang Shinmun*, *Kukmin Ilbo*, *Maeil Business Newspaper*, *Korea Economic Daily*, and *Herald*, among others. In this study, a CEO refers to the representative CEO at the headquarters of each MNE. Although there have been cases of multiple CEOs in one MNE, we distinguished a representative CEO based on the annual reports and company websites. As a result, our final sample comprised 769 CEOs from 347 MNEs.

To collect data on the international diversity of subsidiary TMTs, we sourced information on the nationalities of foreign subsidiary TMTs from Korea Eximbank, a governmental agency for export and FDI credit. As a branch of KMOEF, the primary purpose of Korea Eximbank is to support Korea's export- and FDI-led economy by providing loans and financing megaprojects, thereby facilitating economic cooperation with other countries. This agency manages substantial government funds, including the Economic Development Cooperation Fund and the Inter-Korean Cooperation Fund. Finally, to gather data on board independence and board size, we utilized information from the Korean Corporate Governance Service Information (KOCOinfo) database of KLCA.

3.3. Main variables

3.3.1. Dependent variable

MNEs' radical digital innovation was proxied by the extent of digital transformation-related technologies, measured annually at the MNE level. The operationalization of this variable is based on the content analysis of each MNE's annual reports in the DART database. Past studies have employed various approaches to operationalizing this variable, such as a survey of key personnel who evaluated firms' radical innovation activities (e.g., De Visser and Faems, 2015; Strese et al., 2018). However, there are no established survey instruments that can clearly and concisely capture

the essence of the concept. Also, questionnaires about this concept may lack generalizability and applicability beyond their respective contexts (Delios et al., 2023). In view of these concerns, we designed a content analysis method by quantifying an MNE's annual relative amount of digital transformation-related technology development. This approach is generally applicable because it can (1) be applied across a wide range of sectors, (2) cover a large number of MNEs across relatively long periods, and (3) circumscribe a broad scope of MNE actions. Using this approach, we examined a very large set of annual reports and classified activities related to an MNE's development of digital transformation-related technologies.

Specifically, we identified digital transformation-related technologies by following the operational definitions of three sources: (1) *The Global Risks Report 2017 12th Edition* (the World Economic Forum), (2) *Global Trend 2030: Alternative Worlds* (the National Intelligence Council, 2012), and (3) *Disruptive Technologies: Advances that will Transform Life, Business, and the Global Economy* (McKinsey Global Institute, 2013). We extracted the following quotes or their variants pertaining to the conceptual constructs/sub-dimensions of digital transformation: digital transformation, Fourth (4th) Industrial Revolution, Industry 4.0, cyber-physical systems, smart factory, 3D printing, AI, next-generation genomics, cloud computing, big data, self-driving/autonomous driving, robotics, blockchain, IoT, VR, AR, mixed reality, and next-generation nanotechnology. Appendix 1 provides a full list of terms used to operationalize the digital transformation-related technologies in MNEs' innovation activities.

In recent years, the popularity of computer-assisted coding has increased. Studies have demonstrated that the content analysis method, which involves counting and scoring words and word frequencies without analyzing the textual context, can reproduce results similar to those obtained from more labor-intensive, context-dependent manual or computer-assisted coding (Harrison et al., 2019, 2020; Matthews et al., 2022). In collecting data for our dependent variable, we collected textual information from a total of 3,064 annual reports. These textual data were analyzed using a computer program specifically designed for our research objective, which calculated the number of digital transformation-related words appearing in the annual reports. However, this computer-assisted coding approach inadvertently captures both the intentions and actions of MNEs in terms of digital transformation because not only does a time gap exist between the actual occurrence of actions and future actions motivated by these intentions, but also, some intentions never turn into actions. To address this shortcoming, we advanced the traditional approach and employed a human-based open-language coding method to code annual reports (i.e., an analogous approach).

Analogous research contexts involve two computer-assisted coding methods: closed language and new open language (Harrison et al., 2019, 2020; Matthews et al., 2022). The former uses

predefined words or categories, and the latter uses "a more comprehensive collection of the features of the language being analyzed, such as how often the text features single, uncategorized words, sentence length, multiword phrases, and other features" (Harrison et al., 2019: 1318). The latter method is more recent and is often considered better than the former (Park et al., 2015). However, computer-assisted open-language methods are more suitable for well-established constructs such as the Big Five personality traits (Herrmann and Nadkarni, 2014) because they "require a separate, psychometrically validated measure of a given construct for a subset of observations to further train prediction models" (Harrison et al., 2019: 1319). Additionally, although Harrison et al. (2019) trained their models using a single machine-learning algorithm, namely a gradient boosting machine, this approach cannot "go beyond a trait-by-trait approach." "Models with interactions between multiple traits" still require further development. Because our dependent variable – radical innovation – is associated with digital transformation-related technologies and is a new measurement that involves multiple traits, our human-based open-language coding method allowed us to differentiate actions from intentions that machine-learning algorithms cannot manage.

For example, one of the annual reports from Samsung Electronics states, "The IM (Information Technology & Mobile Communications) division continues to innovate meaningfully to provide valuable experiences to customers through efforts for future growth, including mobile payment service 'Samsung Pay' and intelligent service 'Bixby,' as well as Cloud, IoT, Health, and AR/VR." Through human-based open-language coding, we counted AI ("Bixby"), cloud computing, IoT, AR, and VR as the MNE's actions relevant to the radical innovation of digital transformation. Another part of Samsung Electronics' annual report states, "We have been providing practical and valuable services such as Samsung Pay, Samsung Health, and SmartThings, and we are providing an optimized service experience for users through the more advanced New Bixby." In this text, a machine-learning-based open-language approach would most likely have missed the cases of "Bixby" and "New Bixby" as AI and "SmartThings" as IoT. By contrast, our human-based openlanguage coding correctly identified them as the MNE's actions. Similarly, Hyundai Motors reported, "In particular, as IT/electronic devices are gradually increasing in vehicles, we have preoccupied the future technology field by reinforcing the acquisition of previous patents related to the human-machine interface (HMI), autonomous driving, and mobile interlocking services." In this text, our human-based open-language coding correctly identified and counted human-machine interfaces, autonomous driving, and mobile interlocking services as the MNE's actions. In Appendix 2, we provide examples of how radical innovation associated with the development of digital transformation-related technologies was defined and identified in the annual reports and how radical innovation was linked to these technologies in the content analysis.

Given that potential inaccuracies in the classification of individual items have a minimal effect on large-scale statistical analyses, the most significant threat to validity stems from the accuracy of the terms used to identify digital transformation-related technologies. While the terms were extracted directly from the original definitions proposed by the three credible sources, as previously mentioned, the capacity of these terms to identify actual instances of digital transformation-related technologies required further validation through additional analyses. In performing our humanbased open-language coding analysis, a rater initially analyzed the textual data in the annual report using a coding sheet similar to those adopted by previous studies (e.g., Ostergard Jr., 2000). To establish the validity of our analysis, another rater replicated the same open-language coding analysis method. The inter-rater reliability was 0.927, suggesting a 92.7% agreement between raters on all coded terms, indicating highly reliable data for the measure (Ostergard Jr., 2000).

To further validate our human-based coding and compare its outcomes with those of computerassisted coding, we employed Cohen's kappa to measure the level of agreement between two raters (Cohen, 1960). The inter-coder reliability between the first human rater's coding and computerassisted coding was 0.653 and that between the second human rater's coding and computer-assisted coding was 0.689; both figures indicate substantial agreement between the human raters and the computer-assisted coding. The coders further counted the number of digital transformation terms related to the actions of each MNE for each firm-year. In sum, MNEs' radical innovation was calculated by dividing the number of digital transformation terms by the number of employees, adjusting for firm size. For brevity, we followed the extant literature (e.g., Lee et al., 2023) in using the term "radical innovation" instead of "radical digital innovation" in describing our research model and empirics.

3.3.2. Independent variables

CEO narcissism was operationalized using Chatterjee and Hambrick's (2007) methodology while adopting the unobtrusive measurement approach (Webb et al., 1966; Webb and Weick, 1979). Unobtrusive measures have gained significant momentum in management research, particularly those related to executives, such as CEOs (Carpenter et al., 2004; Matthews et al., 2024). This is because (1) direct access to these senior leaders is always limited, (2) they are often unwilling to participate in survey research involving personal personality traits such as narcissism; and (3) even when they do take part in the research, their answers may be affected by subjective bias caused by social expectations (Carpenter et al., 2004; Chatterjee and Hambrick, 2007; Cycyota and Harisson, 2006; Matthews et al., 2024; Van Scotter, 2020). Unobtrusive measures offer a way to circumvent these issues and provide the advantages of high data availability of the data and large amounts of data, (Matthews et al., 2024). They also have the potential to reduce endogeneity concerns related to

many survey items (Antonakis et al., 2010) and "problems of reactivity, demand characteristics, and researchers' expectations" (Chatterjee and Hambrick, 2007: 362).

In line with previous studies (e.g., Chatterjee and Hambrick, 2007, 2011; Zhu and Chen, 2015a), we measured *CEO narcissism* using the two-year moving average of narcissism indicators. Owing to data availability, we employed three indicators: (1) the prominence of the CEO's photograph in the company's annual report, (2) the CEO's prominence in the company's press releases, and (3) the CEO's use of first-person singular pronouns in interviews. Other studies have included the CEO's compensation and relative pay as additional indicators (e.g., Byun and Al-Shammari, 2021; Chatterjee and Hambrick, 2007, 2011; Engelen et al., 2016; Gerstner et al., 2013; Kashmiri et al., 2017; Zhu and Chen, 2015a, b). These are not included in this study due to data unavailability, which is in line with existing studies that faced the same challenge (e.g., Lee et al., 2023; Yang et al., 2021; Yook and Lee, 2020; Zhang et al., 2021).

Appendix 3 provides detailed discussions of these measures, and Appendix 4 presents how they were aligned with the four components of narcissism identified by Emmons (1984, 1987) through an exploratory factor analysis of the 37-item narcissistic personality inventory (NPI). These indicators showed significant covariation within our sample, enabling us to combine them into a three-item narcissism index. According to Emmons (1984, 1987), the conceptualization of narcissism measured by the NPI can be categorized into four components: (1) authority/leadership (being the center of attention), (2) superiority/arrogance (being better than others), (3) selfadmiration (being preoccupied with how extraordinary I am), and (4) entitlement (insisting on getting the respect that is due). Following Chatterjee and Hambrick (2007) and Yang et al. (2021), we mapped our three indicators against Emmons's four components (see Appendix 4).

Table 3 shows descriptive statistics and correlation coefficients of three narcissism indicators. The correlation coefficients were all positive and significant at p < 0.05. To assess the coherence among the chosen indicators, we performed a confirmatory factor analysis. The results met or exceeded the recommended benchmarks (Non-Normed Fit Index = 0.93, Comparative Fit Index = 0.95, Standardized Root Mean Square Residual = 0.05, and Root Mean Square Error of Approximation = 0.08) (Hu and Bentler, 1995). Additionally, we computed the Cronbach's alpha for the standardized values (mean = 0; standard deviation = 1) of all variables. The alpha coefficient was 0.73, surpassing the threshold deemed acceptable for creating a new index, as suggested by Nunnally (1978).

Insert Table 3 about here

Construct validity test. Consistent with Chatterjee and Hambrick's (2007) methodology, we conducted a brief survey of seven security analysts employed by six major financial institutions in Korea and who had over six years of work experience in the field. Security analysts often interact with CEOs in different contexts through their professional responsibilities, such as small group meetings, large conferences, and informal social gatherings. Furthermore, as media interest in the personalities of CEOs grows due to the 24-hour news cycle, the rise of investigative journalism, and the emergence of multiple digital and social media platforms, these analysts have tended to enhance their technical evaluations of companies with attention to the personal attributes of CEOs (Chatterjee and Hambrick, 2007; Khurana, 2002). This places them in a position as a credible third party to provide peer ratings on the personality traits of many CEOs.

To keep the rating task manageable, the analysts were asked to rate a randomly selected group of 54 CEOs in the sample. Following Chatterjee and Hambrick (2007: 368), these analysts were instructed using the following guidance:

In this short questionnaire, we ask you to draw upon your first-hand familiarity with a number of (recent and current) CEOs. Specifically, we would like you to evaluate, based on your judgment, the extent to which the CEOs mentioned below exhibit traits of narcissism. Narcissism is characterized by exaggerated self-importance, feelings of superiority and entitlement, and an ongoing desire for attention and admiration. Some clear signs of narcissism are: enjoying being the center of attention, insisting upon being shown a great deal of respect, exhibitionism, and arrogance.

The analysts rated the CEOs on a four-point scale (Chatterjee and Hambrick, 2007: 368): "Compared with all CEOs I have known, this one is... (1) not at all narcissistic, (2) slightly narcissistic, (3) moderately narcissistic, and (4) highly narcissistic." They were explicitly instructed to indicate "Not Sure" when they could not answer appropriately; hence, not all 54 CEOs were rated by all seven analysts. Following some degree of certainty, each analyst rated at least 35 CEOs; 47 CEOs were found to have multiple ratings.

The comparison of the ratings from the security analysts with the CEO narcissism index derived as a composite measure of the three narcissism indicators and the examination of the singleitem Intraclass Correlation Coefficients [ICC(1)] functioned as a valuable verification test (Shrout and Fleiss, 1979). For the 47 CEOs who received multiple evaluations from the analysts, the ICC(1) was 0.76 (p < 0.01), signifying a strong agreement among the analysts. The correlation of 0.80 (p < 0.01) between each CEO's average score and our narcissism index shows a close match between the analysts' perceptions and our CEO narcissism index. The third-party ratings provided by the analysts thus serve as external validation of our measure, offering supportive evidence that our measure effectively captures the narcissistic tendencies of the CEOs. *Subsidiary TMT international diversity* was calculated as the nationality diversity of the TMTs in an MNE's subsidiaries. Following past studies such as Belderbos et al. (2022) and Boone et al. (2019), we employed the Blau index to assess the level of heterogeneity (Blau, 1977) in evaluating categorical data and the level of nationality diversity to capture qualitative distinctions as follows:

Blau index of TMT international diversity
$$= 1 - \sum_{i=1}^{k} P_i^2$$
,

where P_i is the proportion of TMTs with the *i*th nationality or country in which their international experience was acquired. This Blau index ranges from zero to (k - 1)/k; therefore, the maximal value is a function of the number of nationalities or countries. The higher the index, the greater the dispersion of subsidiary TMT international diversity.

3.3.3. Control variables

We included additional variables to control the confounding effects identified in previous innovation and narcissism studies. For CEOs, we controlled for those demographic characteristics that were found to affect managerial decisions in past studies (e.g., Chattopadhyay et al., 2008; Carpenter and Fredrickson, 2001; Kuhn, 1970; Sambharya, 1996). First, we controlled for *CEO age*, measured as annual age, because prior research has shown that younger CEOs are keener on paradigm-breaking discoveries and are more likely to pursue radical innovation than older CEOs (Kuhn, 1970). *CEO gender* was controlled as a dummy variable, with male CEOs scoring "1" and "0" otherwise. This control was included to account for gendered effects on CEO decisions. For example, sexism is salient in the corporate culture of some firms (Chattopadhyay et al., 2008), where female CEOs may experience higher levels of task and emotional conflict with their employees and board members, along with higher levels of sex dissimilarity. Consequently, the gender of a CEO may influence their decisions on radical innovation.

Moreover, we controlled for CEOs' overseas working and education experience because prior research has shown that overseas experience affects CEOs' interests and cognitive abilities (Carpenter and Fredrickson, 2001; Sambharya, 1996; Tihanyi et al., 2000). Specifically, it allows CEOs to recognize radical innovation opportunities in the global market (Bloodgood et al., 1996) and may also reduce their risk perceptions of radical innovation (Sambharya, 1996). Overseas markets are substantially more complicated and uncertain than domestic markets; hence, overseas work experience can augment CEOs' tolerance for high uncertainty and risk. Education also significantly contributes to individuals' cognitive foundations (Hambrick and Mason, 1984). Thus, CEOs' overseas education may give them cognitive foundations that enable them to appropriately conduct decision-making tasks in highly uncertain and complicated global markets (Tihanyi et al., 2000). Following past studies, we measured *CEO overseas working experience* as their years of

formal working experience in foreign countries (Carpenter and Fredrickson, 2001; Sambharya, 1996), and measured *CEO overseas education experience* as their years of formal school education out of Korea (Sambharya, 1996; Tihanyi et al., 2000).

Finally, prior research has found that the longer a CEO's tenure, the less likely they are to make radical innovation decisions, which may indicate risk-averse behavior (Heyden et al., 2017). A CEO's tenure may influence their MNE's resource allocation (Heyden et al., 2017) and impact radical innovation decisions. We measured *CEO tenure* as the number of years as a CEO.

In addition to variables controlling CEO influences, we controlled for board-level variables, i.e., board independence and board size, as they are considered to impact firm innovation (for a meta-analysis, see Sierra-Morán et al., 2024). Nevertheless, how they impact innovation, particularly radical innovation, is highly debated. Board independence may create an environment conducive to radical innovation by enhancing governance and accountability and improving the quality of the decision-making process; providing strategic oversight, broad vision, and diverse perspectives; encouraging managerial risk-taking; and facilitating access to the external resources and knowledge required for innovation (Lu and Wang, 2018; Sierra-Morán et al., 2024). However, it may also impede innovation because independent directors might lack firm-specific and/or industry-specific knowledge and impose compliance or conformance burdens (Balsmeier et al., 2017; Sierra-Morán et al., 2024). Similarly, board size may positively impact radical innovation by providing diverse perspectives and facilitating access to external resources and knowledge, but it may also incur high costs (e.g., communication and coordination costs, agency costs) and prolong the decision-making process, hindering radical innovation (Sierra-Morán et al., 2024). Following the existing literature (Sierra-Morán et al., 2024), we operationalized board independence by the ratio of independent directors to total directors and measured board size by taking the logarithm of the number of board of directors in a firm for each year.

Next, we controlled for a number of MNE-level variables, such as age, size, R&D intensity, international experience, and cultural diversity, for multiple reasons. First, we measured *MNE age* using the logarithm of the number of years since the MNE was incorporated, because the age of a firm indicates the operational experience and historical path that the firm may have, which can affect its innovation (Oesterle et al., 2016; Zhu and Chen, 2015a, b). Prior research has also found that the size and R&D input of a firm may affect its innovation (e.g., Lee et al., 2020; Singh et al., 2019). Following these studies, we measured *MNE size* as the logarithm of the MNE's total assets, and *MNE R&D intensity* as the ratio of R&D expenses to the total sales of each MNE.

Moreover, *MNE international experience* has been found to affect a firm's innovation in two dimensions: depth and breadth (Magnusson and Boggs, 2006; Magnusson et al., 2009). We operationalized this variable by multiplying the depth (the number of years from an MNE's first

foreign subsidiary to the observation year) by the breadth (the number of host countries the MNE has entered). We predict that older, larger, more internationally experiential, and technologically savvy MNEs are more likely to accumulate diverse and "learning-by-doing" innovation experiences, as well as abundant tangible, intangible, and human resources (Petricevic and Teece, 2019). By leveraging these resources, MNEs are more likely to pursue radical innovation (Lee et al., 2020).

Additionally, we controlled for MNE cultural diversity (CD), an MNE-specific measure of the aggregated cultural distances of the MNE. As the MNE's cultural diversity increases, the potential for generating and synergizing creative ideas and knowledge across various countries grows. Cultural diversity can also stimulate creativity, augment member satisfaction, enhance communication, and advance innovative learning (Singh et al., 2019). Consequently, MNE cultural diversity can positively influence an MNE's action toward radical innovation in digital transformation. The equation below shows previous measurements of MNE cultural diversity (De Jong and van Houten, 2014; Hutzschenreuter and Voll, 2008; Hutzschenreuter et al., 2011), that is, the sum of the cultural distances for all the combinations of the MNE's home country and the host countries in which it has foreign subsidiaries.

$$CD = \sum_{j=1}^{n} CDI_{j} = \sum_{j=1}^{n} \sum_{i=1}^{4} \frac{(H_{ij} - H_{iD})^{2} / V_{i}}{4}$$

where H_{ij} represents the value of the *i*th Hofstede's cultural dimensions for the culture of the *j*th country, H_{iD} represents the value of the *i*th Hofstede's cultural dimension for the home country, and V_i represents the variance of the cultural dimension. However, as Tung and Verbeke (2010) argue, the influence of cultural distance is not symmetrical for each organization or country. The number of subsidiaries in a host country also influences cultural distance (Hutzschenreuter and Voll, 2008). Therefore, we included a weight as the ratio of the number of foreign subsidiaries n_j in overseas countries *j* to the total number of overseas subsidiaries *N* in the above equation. Specifically, our measurement of the *weighted MNE cultural diversity* (WCD) is as follows (see de Jong and van Houten, 2014: 319):

WCD =
$$\sum_{j=1}^{n} \frac{n_j}{N} CDI_j = \sum_{j=1}^{n} \frac{n_j}{N} \sum_{j=1}^{4} \frac{(H_{ij} - H_{iD})^2 / V_i}{4}$$

Finally, we included firm, industry, and year dummies to control for unobserved factors. Specifically, we included firm dummies because some firms have more slack or financial resources and strong capabilities for radical innovation. Industry dummies were created using the two-digit Korean standard industry code to consider that some industry sectors, such as the high-tech industry, are more likely to conduct radical innovation than others. Additionally, we included year dummies to consider the potential effects of unobserved time differences on radical innovation.

3.4. Statistical modelling and approach

Our sample represents a subset of the total population and is subject to selection bias due to incidental truncation, where the dependent variable is observable if certain explanatory variables have valid observations (Certo et al., 2016). Specifically, our sample comprises only MNEs that carry out radical digital innovation and whose CEOs demonstrate narcissistic traits, as those without such traits are outside the scope. Thus, our final sample includes only MNEs for which at least two out of three indicators of CEO narcissism are available; this is aligned with Chatterjee and Hambrick's (2007) methodology (see Appendix 3 for detailed information). If a CEO has missing data for one indicator but has valid data for the other two, the case still qualifies for assessment as potentially narcissistic. This approach is consistent with recommendations from experts in CEO narcissism and psychiatrists whom we consulted during our research. These experts agree that the presence of narcissistic tendencies can be reliably inferred even when data for one of the indicators is unavailable, provided that the remaining indicators strongly suggest such tendencies.

Since the nonrandom sample can potentially lead to biased OLS results, following other studies of CEO narcissism (e.g., Lee et al., 2023; Zhu and Chen, 2015b), we used a panel data extension of the Heckman two-stage sample selection model (Wooldridge, 1995). The Heckman method, as outlined by Heckman (1979) and further elaborated by Heckman and Navarro-Lozano (2004), involves the first stage of using a probit model to estimate the probability of an observation's entry into a sample, which in our case reflects the likelihood of including narcissistic CEOs (see Appendix 3 for detailed information). Following a commonly employed procedure and methodology (e.g., Birhanu et al., 2016), we used the sector's average narcissism as the variable to meet the condition of exclusion restriction (Certo et al., 2016). This involved calculating the average CEO narcissism for each sector. This instrument's validity hinges on two main criteria: its relevance (its correlation with the potentially endogenous variable in the first phase) and its exogeneity (its non-correlation with the error term in the second-stage panel regression with a random-effects model) (Murray, 2006). In the subsequent step, the non-selection hazard (also known as the inverse Mills ratio) derived from the initial model was incorporated into the second-stage panel regression with a random-effects model (Greene, 2008).

Fixed-effects models are normally favored in panel data analyses (Greene, 2008). However, when the fixed effects are uncorrelated with other independent variables, a random-effects model can be a viable alternative. To choose between a fixed-effects and a random-effects model, we performed a Hausman test (Hausman, 1978). The test statistic is statistically insignificant at the 5%

level, providing evidence that we cannot reject the null hypothesis that both the coefficients of the fixed-effects and random-effects models are consistent, but the coefficients of the random-effects model are efficient. Consequently, we present the findings from the random-effects model.

In addition, we checked the normality of the data distribution by performing a Kolmogorov– Smirnov test; Kolmogorov–Smirnov Z is 19.024, which is statistically significant, thus the null hypothesis is rejected (Greene, 2008). However, given our large sample size (n = 3,064), we can apply the central limit theorem, which states that for independent and identically distributed random variables, the sampling distribution of the standardized sample mean can be approximated by normal distribution regardless of the distribution of the population (Greene, 2008). Hence, we can still apply the usual parametric tests, such as t-tests, as they are robust to deviations from normality.

4. Results

Table 4 shows the descriptive statistics and the correlations for all the variables in our study. The statistics of maximum, minimum, and standard deviation indicate that the continuous variables are widely spread out and have reasonable variability. Regarding the correlation coefficients, noticeably, our main variables of CEO narcissism and subsidiary TMT international diversity are positively and significantly correlated with MNEs' radical innovation ($r_{CEOnarcissism-innovation} = 0.06, p < 0.01$; $r_{TMTdiversity-innovation} = 0.05, p < 0.01$). The pairwise correlation coefficients between the explanatory variables are low; the highest correlation coefficient is between CEO previous overseas education and MNE international experience; the size is modest ($r_{CEOeducation-MNEexperience} = 0.47, p < 0.01$). Therefore, there is less concern about multicollinearity. To further check for multicollinearity, we computed the variance inflation factors (VIF) for all the variables. The largest VIF is 2.29, which is substantially lower than the recommended cutoff of 10, indicating that multicollinearity is not a problem.

Insert Table 4 about here

Table 5 presents the analytical results of the panel regression with a random-effects model for radical innovation. Model 1 includes only the control variables, Model 2 encompasses the two independent variables of CEO narcissism and subsidiary TMT international diversity, and Model 3 incorporates their interaction term further. H1 predicts that CEO narcissism positively influences MNEs' radical innovation, suggesting a positive coefficient of CEO narcissism. In Model 2, CEO narcissism is positively and significantly associated with MNEs' radical innovation (b = 0.257, p = 0.040); this result is consistent in Model 3 (b = 0.276, p = 0.027), where all the independent variables and interaction term are included. Therefore, the regression results strongly support H1.

H2 predicts that subsidiary TMT international diversity positively affects MNEs' radical innovation, thus suggesting a positive coefficient of subsidiary TMT international diversity in the regression models. In Model 2, subsidiary TMT international diversity is found to be positively and significantly associated with MNEs' radical innovation (b = 1.220, p = 0.000); this result is consistent with that in Model 3 (b = 1.819, p = 0.000). Hence, the results robustly support H2. Lastly, H3 predicts that subsidiary TMT international diversity negatively moderates the positive effect of CEO narcissism on MNEs' radical innovation, implying a negative coefficient of the interaction term between CEO narcissism and subsidiary TMT international diversity. In Model 3, this interaction term is negatively and significantly associated with MNEs' radical innovation (b = -2.705, p = 0.000), thereby providing empirical support to H3.

Insert Table 5 about here

There are interesting results related to the control variables. Model 1 of Table 5 shows that CEOs' previous overseas experience is positively and significantly associated with MNEs' radical innovation (b = 0.077, p = 0.000). Hence, our findings reveal that CEOs who have been exposed to foreign cultures and environments are more likely to pursue radical innovation based on the creative ideas, knowledge and learning they have gained (Singh et al., 2019). Model 1 also presents that board independence is positively and significantly associated with MNEs' radical innovation (b =1.436, p = 0.000), and board size is negatively and significantly associated with MNEs' radical innovation (b = -1.623, p = 0.000); these findings are consistent with those of Models 2 and 3. They suggest that although board independence facilitates radical innovation, large board size has a detrimental effect. Model 1 further shows that MNE age, size, R&D intensity, and cultural diversity are positively and significantly associated with MNEs' radical innovation ($b_{MNEage} = 0.167$, p =0.001; $b_{MNEsize} = 0.139$, p = 0.000; $b_{R\&D} = 0.086$, p = 0.006; $b_{CD} = 12.624$, p = 0.000); these results are consistent with those of Models 2 and 3. Together, these findings suggest that older, larger, technologically advanced, and culturally diverse MNEs are more inclined to pursue radical innovation. This propensity can be attributed to their accumulation of extensive "learning-by-doing" innovation experience, abundant slack resources, and a rich pool of culturally diverse global talents brimming with creative ideas and knowledge (Singh et al., 2019). Such assets enable these MNEs to blend these talents effectively, driving radical innovation through cross-border R&D collaboration (Lee et al., 2020).

4.1. Robustness tests

We conducted additional robustness tests on the dependent and independent variables. First, instead of weighting MNEs' radical innovation by the total number of employees in each MNE, we weighted this variable by the total assets and total sales of each MNE. The results do not change qualitatively from the main findings. Second, we conducted a sensitivity test using the MNEs' digital transformation operationalized by computer-assisted coding as an alternative measure. The results are again qualitatively similar to the main analytical results. Third, we conducted a panel regression analysis using a fixed-effects model to control for firm-level unobserved heterogeneity. The results, which are available upon request, closely resemble those from the panel regression analysis using a random-effects model.

5. Discussion and conclusion

We have investigated the separate and joint effects of CEO narcissism and TMTs' international diversity on radical innovation. Radical innovation is often chaotic, fraught with uncertainty and risk, and stretches firms beyond their current scope of capabilities and familiar markets for products and service offerings (McDermott and O'Connor, 2002). However, radical innovation appeals to narcissistic CEOs because it can support their grandiose visions and bold, confident, and competent appearance. Our findings concerning CEO narcissism and radical innovation are consistent with the arguments that narcissistic CEOs' cognitive and motivational frameworks introduce a bias in their decision-making and result in their organizations making radical innovation decisions. However, narcissistic CEOs' adventurous urges may be reined in by TMTs at the subsidiary level as a governance mechanism, as shown by the moderating effect of the international diversity of subsidiary TMTs. In other words, when narcissistic CEOs are confronted by highly diversified subsidiary TMTs, their risk-taking behaviors are checked and moderated by the diversified group dynamics.

5.1. Theoretical contributions

Our study makes four related contributions to the literature. First, we extend the emerging literature on strategic leadership and innovation by examining the independent and joint effects of CEOs and TMTs on radical innovation (Cragun et al., 2020; Georgakakis et al., 2022; Heyden et al., 2017; Kraft 2022). Although the cognitive and motivational mechanisms underlying CEO narcissism explain why narcissistic CEOs drive radical innovation (Chatterjee and Hambrick, 2007; Kashmiri et al., 2017), Kraft (2022: 767) has called for further exploration of the role of TMTs as they "might help to challenge the views and decisions of narcissistic CEOs and consequently improve the decision-making processes." Addressing this call, we develop a theoretical framework

that integrates two groups of strategic leaders (CEOs and subsidiary TMTs), drawing on the extended agency model of narcissism (Campbell and Foster, 2007) and upper echelons theory (Carpenter et al., 2004; Hambrick, 2007; Hambrick and Mason, 1984). Our study aligns with the grandiose narcissism research stream, employing its established definition (Cragun et al., 2020) and measurement (Chatterjee and Hambrick, 2007). The framework enables us to theorize and test the independent and joint effects of CEO narcissism and subsidiary TMT international diversity on radical innovation. Radical innovation, while sometimes including explorative elements, often transcends incremental improvements by driving revolutionary rather than evolutionary changes (Tidd and Bessant, 2013). Such innovation aligns with narcissistic CEOs' grandiosity (Shan et al. 2023; Steinberg et al., 2022; and Wang et al., 2023). By examining these dynamics, our study provides a vehicle to reconcile the inconclusive findings on the CEO narcissism-innovation relationship.

Second, we contribute by extending the CEO narcissism-innovation link to the MNE context of strategic choices. While CEO narcissism has garnered attention in the broad business and management literature (Brunzel, 2021; Campbell et al., 2011; Cragun et al., 2020; Fatfouta, 2019) and the importance of TMTs for MNEs has been established (Cuypers et al., 2022; Georgakakis et al., 2023), the impact of narcissistic CEOs on radical innovation within MNEs remains underexplored, as evidenced in Table 1. Our study sheds light on MNEs' radical digital innovation, with a focus on CEOs' grandiose narcissism, offering a more nuanced understanding of the narcissism-innovation relationship. This contribution is particularly important in that MNEs operate in highly uncertain and competitive IB environments characterized by cross-border informational limits and reliability constraints (Georgakakis et al., 2023). This fuels narcissistic CEOs' impulses to set radical innovation agendas that are bounded by limited information, cognitive bias, causal ambiguity, and partial analyses. Prior research has shown that excessive risk-taking by narcissistic CEOs is associated with extreme and fluctuating organizational performance (Chatterjee and Hambrick, 2007; Lee et al., 2023). Such volatility may create strategic dilemmas (e.g., whether to invest and where to invest), organizational uncertainty (e.g., difficulties in recruiting and retaining talents), and reputational risks with investors and in the market. As a corporate CEO wields substantial power and influence over the entire MNE network comprising headquarters and subsidiaries, CEO narcissism ultimately impacts the MNE's global performance (Lee et al., 2023), including its radical innovation efforts.

Third, we broaden the literature on the CEO–TMT interplay by investigating the role of CEO traits and TMT diversity in driving radical innovation and contextualizing it within MNEs. Echoing recent calls for studies on the multi-level strategic leadership interface in the MNE context (Cuypers et al., 2022; Georgakakis et al., 2023), our framework distinguishes the effects of different strategic

leaders in an MNE and provides a new perspective on MNEs' innovation strategies. Whereas corporate CEOs obtain substantial power over MNEs' subsidiaries, foreign subsidiary TMTs are not passive recipients of CEOs' decisions but can exert impacts by presenting persuasive arguments (Georgakakis et al., 2023; Kostova et al., 2016; Simsek et al., 2018; Van Doorn et al., 2022) and via the collective cognition (Hambrick, 2007; Pisani et al., 2018; Talke et al., 2010). Prior research has offered evidence of the CEO-TMT interplay in the same entity at the same location (Georgakakis et al., 2022). We tease out the joint proximal impact of two interdependent agencies working at geographically distant locations - corporate CEOs at headquarters in the home country and subsidiary TMTs in host countries – thereby adding novel insights to the underexplored dynamics between strategic leaders (Georgakakis et al., 2023; Simsek et al., 2018). The headquarterssubsidiary distance introduces challenges in aligning priorities of strategic leadership, adding complexity to the CEO-TMT dynamics. Geographically and institutionally separated locations may increase information asymmetries and affect decision-making within MNEs (Tang and Buckley, 2022), but such distance can also provide subsidiary TMTs with greater autonomy, which allows for innovation strategies tailored for local market conditions and institutional environments (Belderbos et al., 2022). Incorporating headquarters and foreign subsidiaries into our study sheds light on how MNEs navigate the tension between strategic leadership and innovation efforts across home and host countries.

Fourth, we enhance the understanding of international corporate governance by revealing subsidiary TMTs as a governance mechanism for curbing corporate CEOs' narcissistic decisions on radical innovation. We argue that subsidiary TMTs may regulate narcissistic CEOs' decision latitude and mitigate their dispositional imposition, thereby altering the CEO narcissism–radical innovation relationship. Our theoretical framework and empirical findings suggest that upper echelons theory should be extended through the simultaneous consideration of CEOs' traits (e.g., narcissism) and TMTs' composition (e.g., international diversity) to gain a better understanding of the corporate governance practices at play in pursuing MNEs' innovation. In contributing to the emerging literature on international corporate governance (Aguilera et al., 2019), our findings reveal that subsidiary TMTs play a critical agency role in alleviating the potency of corporate narcissistic CEOs and mitigating the bounded rationality in the latter's enactment of their radical innovation leadership. Our evidence suggests that research should continuously make inroads into the examination of CEO narcissism and its boundary conditions to bring out potential "bright" side of narcissistic CEOs in MNE innovation.

5.2. Practical implications

This study has implications for MNEs in terms of appointing their senior leadership teams and managing their strategies, particularly when pursuing radical digital innovation in diverse and dynamic environments against the backdrop of the political and trade tensions between countries that are reshaping globalization. CEOs and foreign subsidiary TMTs are expected to lead firms in the ever-changing international environment and leverage their vision, skill sets, and capabilities to enhance innovation to ensure their firms' sustainable growth. CEO attributes and TMT composition are important in the strategic decision-making of internationalized firms. Although successful radical innovation offers MNEs a competitive advantage, managing it to achieve success is challenging, with radical innovation projects suffering from a very high failure rate. Therefore, while narcissistic CEOs can spur radical innovation, MNEs need to establish a mechanism at the subsidiary level that can provide checks and balances to headquarters' CEOs and ensure the soundness of radical innovation. CEOs also need to regularly reflect on their strategic leadership in the context of the CEO–TMT interface, which brings out and sustains the upside of narcissism. Equally, MNEs need to align the leadership of their CEOs and TMTs with their innovation strategies as an integral part of their business approach.

5.3. Limitations and future directions

Our study has several limitations that relate to its data sources, methods, measures, and research context, which provide prosperous avenues for future research. First, some of our data are taken from annual reports, which may not fully represent the firms' strategic intentions or achievements. While annual reports are commonly used to study firm strategy and innovation (Michalisin, 2001), they can be influenced by self-serving bias. For example, firms may have the incentive to present their innovation performance in a favorable light to attract investors, customers, and other stakeholders. Such reporting and framing biases might not provide a complete reflection of strategic decisions. Additionally, the degree of such biases may vary across cultural contexts and regulatory environments (Sidle, 2009). Consequently, it is advisable for future research to use alternative measures for some of the variables that rely on the information contained in annual reports.

Second, endogeneity may arise, if unobserved factors simultaneously influence CEO narcissism and MNEs' radical innovation. For example, the diversity of the corporate TMT and that of the subsidiary TMTs could jointly moderate the radical innovation effect of CEO narcissism. While this was not a concern for our study due to the lack of diversity among corporate TMT members in Korean MNEs, where corporate TMTs are mostly of Korean males in their 50s, future studies should address this issue when extending the research to other countries. Endogeneity could

also come from omitted variables. For example, narcissistic personality traits can be paired with other personality traits, such as humility (Nie et al., 2022; Zhang et al., 2017). Together, they may result in more and/or different thoughtful actions. The coexistence of different or even paradoxical traits may enhance or hinder a CEO's motivation to lead radical innovation. CEOs do not operate in isolation; thus, when making radical innovation decisions, both their traits and those of the foreign subsidiary TMT members matter. Future research could examine the CEO–TMT interface by examining collective traits, such as the interactions between CEOs and other top executives' narcissistic personalities.

The third limitation relates to our measures of the dependent and independent variables. For the dependent variable, our assessment of digital transformation relied solely on the content analysis of annual reports, and the effectiveness of content analysis is largely contingent on the accessibility and caliber of the content. If our sourced content is not all-encompassing, as mentioned above, our comprehension of digital transformation may be incomplete. Future research should devise objective metrics, such as the number of patents or new product launches, to further assess radical innovation and validate and strengthen our findings. Concerning the independent variable of CEO narcissism, we operationalize it by employing three indicators from Chatterjee and Hambrick's (2007) original index that can be mapped to Emmons' four NPI components (see Appendices 3 and 4). Our measure does not include the two other indicators in Chatterjee and Hambrick's (2007) original index, namely CEO compensation and relative pay. These may capture the dimensions of authority/leadership and superiority as highly narcissistic CEOs believe that they are far more valuable to the firm than anyone else, which is reflected in their compensation; CEOs are also known to have considerable influence in setting their pay (Chatterjee and Hambrick, 2007, 2011). However, the disclosure of executive compensation details is not the case in South Korea. Including compensation components as part of the CEO narcissism measure could be an avenue for future research. Likewise, alternative unobtrusive measures (e.g., third-party psychometric ratings or broader behavioral indicator indices) or survey-based measures (e.g., NPI) can be employed to ascertain the robustness of our empirical findings.

Fourth, our findings regarding the effects of CEO narcissism on radical innovation illustrate the role of executive personality profiles such as narcissism in shaping radical innovation in Korean MNEs and add further evidence to this line of enquiry. However, caution is warranted when interpreting these results globally, as national cultures shape perceptions, behaviors, and psychological processes. For example, collectivist cultures place greater emphasis on harmony and norms of reciprocity than individualistic cultures; therefore, self-promotion behaviors deemed acceptable in the latter context may be perceived as narcissistic in the former (Grijalva and Newman, 2015; O'Boyle et al., 2012). Future research, thus, should be conducted across diverse

cultural contexts to illuminate how narcissistic leadership may be viewed and how it impacts corporate decisions in different settings.

Finally, we must exercise caution when generalizing our findings across industries and periods, because their generalization is limited by industry and time. Distinct cultures, challenges, and innovation regimes exist (Godoe, 2000) while radical digital adoption and CEO narcissism's impact vary significantly; thus, what appeals in one industry may not in another. Perceptions of narcissism also shift (Gnambs and Appel, 2018), so past narcissistic behaviors might now be seen as assertive. Therefore, future research should examine specific industries and time periods to gain a nuanced understanding to address generalizability concerns.

Appendix 1. Terms and term roots in content analysis^a.

digital transform^{*}, DT^{*}, DX^{*}, Fourth Industrial Revolution^{*}, 4th Industrial Revolution^{*}, 4IR^{*}, Industry 4.0^{*}, Cyber-Physical Systems^{*}, CPS^{*}, smart factory^{*}, 3D printing^{*}, artificial intelligence^{*}, AI^{*}, next-generation genomics^{*}, robot^{*}, block chain^{*}, Internet of things^{*}, IoT^{*}, Virtual Reality^{*}, VR^{*}, Augmented Reality^{*} AR^{*}, cloud comput^{*}, big data^{*}, self-driv^{*}, autonomous driv^{*}, next-generation nanotech^{*}, 5G^{*}

^a The wildcard ^{**} can represent any character.

Appendix 2. Examples of digital transformation-related technologies and associated radical digital innovation identified through content analysis.

| MNE name | Example |
|---------------------|---|
| Samsung Electronics | "Also, the DX (Device eXperience) division, in line with the Fourth |
| | Industrial Revolution, is actively expanding its business development |
| | efforts to strengthen its position not only in the smartphone market but |
| | also in the overall mobile market. These efforts include tablets, wearables, |
| | and accessories, along with future growth drivers such as Digital Health |
| | and Digital Wallet, and fostering next-generation innovative businesses." |
| | "Our company is operating a product portfolio optimized for regional |
| | market conditions and competitive environments by utilizing a diverse |
| | and competitive smartphone lineup, ranging from premium to budget- |
| | friendly models. Particularly, our premium smartphones continue to |
| | showcase differentiated features through next-generation technological |
| | innovations based on customer needs in the era of the digital |
| | transformation revolution. These include support for Dynamic AMOLED |
| | 2X (120Hz) on large Infinity Displays, digital key and content sharing |
| | through UWB (Ultra Wideband), water and dust resistance, fast wired and |
| | wireless charging, ultrasonic on-screen fingerprint recognition, high- |
| | resolution and high-magnification/night photography using AI |
| | technology, and 8K video recording, among others." |
| Hyundai Motor | "The patents we hold are applied to our products and business, or secure |
| | technologies that could potentially be strategically utilized in future next- |
| | generation businesses. These patents protect our products and business |
| | and enhance our innovative technology and business competitiveness |
| | against competitors. We are particularly strengthening our patent |
| | acquisition in future technology areas related to the 'electronization' of |
| | vehicles, such as autonomous driving, Advanced Driver Assistance |
| | Systems (ADAS), IT service technology, and in eco-friendly fields such |
| | as electric vehicles, hybrids, fuel cells, to enhance our competitiveness in |
| | the future market. Additionally, we are also expanding our patents in new |
| | business/new technology areas where fundamental innovation is needed, |
| | such as robots, mobility, hydrogen, and open innovation." |
| | "As another pillar of our growth strategy, we have been researching and |
| | developing new mobility devices such as Purpose Built Vehicles (PBV), |
| | Advanced Air Mobility (AAM), and robotics, with the goal of |
| | commercialization after 2025. For PBV, based on our R&D, we can enter |
| | the market based on cost competitiveness and are pushing for the |
| | ennancement of a service package-based revenue model. For AAM, |
| | commercialization has been prepared to target the market after 2025, |
| | Incusing on the development of future-oriented differentiated technology |
| | and intrastructure (with the goal of commercializing Urban Air Mobility (UAM) by 2028 and compare singulations (UAM) by 2028. |
| | (UAIVI) by 2028 and cargo aircrait by 2030). In the area of robotics, we |
| | are pushing forward with industrial, medical, and service robot |
| | businesses, and we are also developing Last Mile Mobility solutions." |

Appendix 3. CEO narcissism indicators.

In line with the CEO narcissism literature (for reviews, see Cragun et al., 2020; Matthews et al., 2024; Van Scotter, 2020), we have adopted Chatterjee and Hambrick's (2007) methodology in constructing CEO narcissism indicators. The criteria for selecting the indicators centered around two key principles. First, each indicator would be a result of the CEO's own choices, ensuring that it was a true reflection of the CEO's personality rather than the outcome of external pressures or institutional mandates. The aim was to choose indicators that the CEO had significant control over. Second, each indicator represents one or several characteristics of narcissistic personality traits.

(1) *Prominence of the CEO's photograph.* The annual report of an MNE not only serves as a platform for CEOs to discuss their firm's achievements and future outlook but also as a venue to highlight their leadership role. While it is common for CEO photographs to be included in annual reports, their presence and prominence can vary. Chatterjee and Hambrick (2007) consulted with three communications experts and confirmed that CEOs closely oversee the creation and presentation of annual reports, especially concerning their personal portrayal within these documents. It stands to reason that a CEO with pronounced narcissistic traits would pursue significant exposure in the annual report, both as a manifestation of self-admiration and to assert their paramount importance within the organization. We assessed this indicator using a specific scale: four points were awarded if the CEO's photograph was featured solo and took up more than half a page; three points for a solo photo that occupied less than half a page; two points if the CEO was shown alongside other fellow executive(s); and one point if the CEO was not pictured at all.

(2) *CEO's prominence in the company's press releases.* MNEs release press statements on various topics, such as earnings reports, product launches, significant contracts, organizational changes, key appointments, and more. The CEO has full authority over the content of these press releases. Conversations with communications experts revealed that CEOs enforce strict criteria for public announcements and personally oversee the approval of nearly all communications, except for those that are routine. These press releases offer an additional platform for highly narcissistic CEOs to remind stakeholders of their leadership role within the company. Such CEOs tend to demand frequent mentions in these communications, both as a display of self-importance and to underline their leadership position. To evaluate this aspect, we determined the frequency of the CEO's name in the company's press releases and normalized this count by the total word count of all press releases issued by the firm.

(3) *CEO's use of first-person singular pronouns in interviews*. Speech acts as a mirror of an individual's most enduring and dominant personality characteristics, serving as a medium of "expressive behavior" through which these traits are vividly expressed (Hogben, 1977). The prevalence of first-person singular pronouns, indicative of self-focus, has been identified as a

marker of narcissism (Raskin and Shaw, 1988). In our analysis, we utilized transcripts of interviews with CEOs, conducted either by journalists or financial analysts, focusing specifically on the segments that captured the CEOs' own words. We calculated the frequency of first-person singular pronouns (I, me, mine, my, myself) used by each CEO, and this total was divided by the aggregate of these singular pronouns and all first-person plural pronouns (we, us, our, ours, ourselves). The resultant score represents the percentage of all first-person singular pronouns, serving as our metric for narcissism.

Using two databases, i.e., Web of Science and Google Scholar, we searched for studies on CEO narcissism published in journals rated as 3* or 4* in the 2024 Academic Journal Guide by the Chartered Association of Business Schools. We only identified one paper employing unobtrusive measures of CEO narcissism in Korea, Lee et al. (2023). Lee et al.'s (2023) study used the same three indicators as those used in the present paper. Although the two papers are not directly comparable due to differences in the dependent, mediating, and moderating variables, the baseline measures, such as means and standard deviations for CEO narcissism, are similar between the two studies.

| Narcissistic Per | sonality Inventory | The indicators of Chatterjee and Hambrick's (2007, 2011) | | | | | | | |
|------------------|--------------------|--|-------------------|-----------------------|--|--|--|--|--|
| 1) | NPI) | CEO narcissism measure and the corresponding | | | | | | | |
| | | characteristics | | | | | | | |
| NPI | Characteristics | (1) the | (2) CEO's | (3) CEOs' use of | | | | | |
| component | | prominence of the | prominence in | first-person singular | | | | | |
| | | CEO's | the company's | pronouns | | | | | |
| | | photograph | press release | | | | | | |
| (1) authority/ | being the center | I am at the heart | I am the core | All achievements | | | | | |
| leadership | of attention | of the company | person of the | are under my | | | | | |
| | | | firm, and I | leadership | | | | | |
| | | | should be the | | | | | | |
| | | | center | | | | | | |
| (2) superiority/ | better than others | I am the head of | I am special and | I represent the | | | | | |
| arrogance | | the firm, and the | should observe | whole firm | | | | | |
| | | publicity should | attention | | | | | | |
| | | focus only on me | | | | | | | |
| (3) self- | preoccupied with | I am attractive | I enjoy the | I am the core | | | | | |
| admiration | how | | internal and | leadership and lead | | | | | |
| | extraordinary I | | external praise | to the success | | | | | |
| | am | | | | | | | | |
| (4) entitlement | insisting on | My importance | I should deserve | I am in charge of | | | | | |
| | getting the | should be | a lot of coverage | the firm and any | | | | | |
| | respect that is | highlighted | | achievement is due | | | | | |
| | due | | | to my involvement | | | | | |

Appendix 4. Mapping of NPI components and CEO narcissism indicators.

Source: Adapted from Chatterjee and Hambrick (2007) and Yang et al. (2021).

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| | Study | Sample | | Dependent | CEO narcissism | Key findings |
|---|---------------------------|---------|--|--|---|---|
| | | Country | Data | variable(s) | measurement | |
| 1 | Chang et al. (2023) | China | 273 Chinese manufacturing firms in the Yangtze Delta of China | Green innovation | Psychometric measures based on a questionnaire survey of marketing managers' evaluation of CEOs | CEO narcissism is positively associated with green innovation. |
| 2 | Cragun et al. (2020) | | Meta-analysis based on 6 primary studies | New product introductions | | The relationship between CEO narcissism and new product introductions is positive and statistically significant. |
| 3 | Gerstner et al. (2013) | US | 72 CEOs of 33 U.S. research-based pharmaceutical firms, 1980-2008 | The degree of adoption of a discontinuous technology measured by the number of new strategic initiatives | CEO narcissism index based on Chatterjee and Hambrick (2007) | The more narcissistic a CEO is, the more likely the company will adopt a discontinuous technology for a radically new strategic priority. |
| 4 | Ham et al. (2018) | US | 741 CEOs of 411 S&P 500 companies, 1992- 2015 | R&D expenditures | CEO's signature size | CEO narcissism is positively associated with R&D expenditures. |
| 5 | Junge et al. (2024) | US | 224 CEOs of 120 S&P 100 companies, 2008-2018 | Relative exploration orientation (vs. exploitation) | CEO narcissism index based on Chatterjee and Hambrick (2007) | CEO narcissism is negatively associated with a firm's relative exploration orientation, indicating that narcissistic CEOs address an exploitation orientation. |
| 6 | Kashmiri et al. (2017) | US | 395 publicly listed U.S. firms, 2006-2010 | Speed of innovation Proportion of radical innovation in a new product portfolio | CEO narcissism index based on Chatterjee and Hambrick (2007) | Narcissistic CEOs are likely to exhibit a higher rate of new product introductions. Narcissistic CEOs are likely to introduce more radical innovation in their new product portfolios. |
| 7 | Kraft (2022) | N/A | Meta-analysis based on 68 studies | A variety of innovation measures | N/A | There is a positive, statistically significant relationship between CEO narcissism and innovation. The relationship is weaker for female CEOs than for male CEOs, and stronger in countries characterized by high levels of managerial discretion. |
| 8 | Khanchel et al. (2024) | US | 224 CEOs of 206 S&P 500 companies, 2010-2019 | Green innovation | CEO narcissism index based on Chatterjee and Hambrick (2011) | CEO narcissism is positively associated with green innovation. |

Summary of quantitative studies linking CEO narcissism to innovation-related studies.

| 9 | Leonelli et al. | Italy | 115 CEOs of Italian start- | Startups' innovation | Psychometric measures | The relationship between entrepreneurs' narcissism |
|----|--------------------------|-------|--|---|---|---|
| | (2019) | | ups | (measured with patent) | survey of CEOs | shape, suggesting that both high and low levels of |
| | | | | | | narcissism can be detrimental to innovation. |
| 10 | Nie et al. (2022) | China | CEOs of 239 manufacturing firms in China | Explorative and exploitative innovation | Psychometric measures based on a questionnaire survey of marketing and R&D managers' evaluation of CEOs | CEO narcissism alone has a negative effect on exploitative innovation, but not explorative innovation. However, CEOs who possess a balance of narcissism and humility positively impact both exploitative and explorative innovation. |
| 11 | Rovelli et al. (2023) | Italy | CEOs of 102 Italian family firms | The exploitation of innovation opportunities | Psychometric measures based on a questionnaire survey of CEOs | Family firms led by more narcissistic CEOs seize greater innovation opportunities by promoting a higher level of strategic decision-making comprehensiveness within their top management team. |
| 12 | Shan et al. (2023) | China | 275 Chinese listed companies, 2012-2020 | Exploratory and exploitative innovation measured by the frequency of keywords related to exploratory and exploitative innovation as the share of the total number of annual reports, respectively | CEO narcissism index based on Chatterjee and Hambrick (2007) | CEO narcissism has a positive effect on both explorative and exploitative innovation; and CEO power moderates the effect of CEO narcissism on explorative innovation, but not on exploitative innovation. |
| 13 | Steinberg et al. (2022) | US | 224 CEOs of 120 U.S. firms in the S&P 100 Index, 2008-2018 | Degree of relative exploration vs. exploitation | CEO narcissism index based on Chatterjee and Hambrick (2007) | CEO narcissism is negatively associated with firms' relative explorative innovation and emphasizes an exploitation-oriented innovation for efficient and instant outcomes. |
| 14 | Wang et al. (2022) | China | Chinese listed firms, 2007-2020, the total number of observations is 1282, but the number of CEOs is unknown | Innovation input measured by the ratio of R&D investment to total assets | CEO's signature size | CEO narcissism is negatively associated with innovation input. However, such effects are negatively moderated by financial constraints, meaning in financially constrained firms, narcissistic CEOs are more aggressive in investing in R&D. The interactive effects of financial constraints and CEO narcissism are greater in large firms than in small firms. The negative effects of CEO narcissism are stronger in non-SOEs than in SOEs. |

| 1 | 5 Wang et al. (2023) | China | Chinese list firms, 2015- 2020, the total number of observations is 798, but the number of CEOs is unknown | Exploratory innovation measured by the number of invention patents (log) Exploitative innovation measured by the number of utility models and appearance patents (log) | CEO narcissism index based on Chatterjee and Hambrick (2007) | CEO narcissism has a positive effect on both explorative and exploitative innovation, but a more significant effect on exploratory innovation; and corporate social responsibility mediates the relationship between CEO narcissism and innovation (both exploratory and exploitative). |
|---|---------------------------------------|-------|--|---|--|--|
| 1 | 5 Yang et al. (2021) | China | 349 Chinese-listed firms, 2014-2018 | Green technology innovation | CEO narcissism index similar to Chatterjee and Hambrick (2007) | CEO narcissism has a positive and significant impact on green technology innovation, both directly and indirectly through moderating the impact of fulfillment of internal corporate social responsibility (CSR), but its moderating effect on the fulfillment of external CSR is negative. |
| 1 | 7 You et al. (2023) | China | 132 CEOs from firms located in 17 industrial towns in an Eastern province of China | Innovation ambidexterity | Psychometric measures based on a questionnaire survey of CEOs | CEO narcissism is negatively associated with innovation ambidexterity and such a relationship is the strongest when CEO power is intermediate and when a firm's reputation is intermediate. |
| 1 | 3 Zhang et al. (2017) | China | Study 1 (63 CEOs, 328 top managers, and 645 middle managers) Study 2 (143 CEOs and 190 top managers in Study 2) | Innovation performance | Psychometric measures based on questionnaire survey of CEOs | Narcissistic and humble CEOs bolster socialized charisma, leading to improved firm innovation performance. |
| 1 | Zhang et al. (2021) | China | 402 Chinese-listed companies (103 state- owned enterprises (SOEs) and 299 non-SOEs), 2010-2019 | Innovation performance, including innovation input measured by the ratio of R&D and operating income and innovation output measured by the number of patent applications | CEO narcissism index similar to Chatterjee and Hambrick (2007) | CEO narcissism has a positive and significant impact on firm innovation performance both directly and indirectly through the mediator of debt financing, and such effects are stronger in SOEs compared with non-SOEs |

Note: We searched the Web of Science database to conduct a systematic literature review on the topic of CEO narcissism and innovation using the following terms: CEO OR "Chief executive officer*" (Topic) and narciss* (Topic) and innovation OR R&D OR "research*development" OR patent OR "new product" OR "new technolog*" (Topic). 29 results were returned. Reading these articles, we identified 18 papers as relevant, and their references helped us to further identify one more relevant paper. The research contexts and key findings for these 19 primary studies are summarized in this table – Table 1.

Multidimensional perspectives on radical digital innovation in chronological order by publication year.

| Authors | Definition of digital transformation-related technology development |
|------------------------------------|---|
| Stolterman and Fors (2004) | The changes that digital technology causes or influences in all aspects of human life. |
| Martin (2008) | Now commonly interpreted as such usage of information and communication technology, when trivial automation is not performed but fundamentally new capabilities are created in business, public government, and in the life of people and society. |
| Westerman et al. (2014) | Unlike incremental changes, digital transformation represents a profound shift that requires companies to fundamentally rethink their business models, operational processes, and customer interactions. This necessitates a commitment to fundamentally changing the organization's culture and operations. |
| Solis (2017) | The realignment of, or new investment in, technology, business models, and processes to more effectively compete in an ever-changing digital economy. |
| Reis et al. (2018) | The use of new digital technologies that enables major business improvements and influences all aspects of customers' life. |
| Veldhoven and Vanthienen (2019) | The continuously increasing interaction between digital technologies, business, and society, which results in transformational effects and increases the change in process velocity, scope, and impact. |
| OECD (2019) | A multifaceted and fast-moving phenomenon that changes the business models of firms using new digital technologies. |
| Rogers (2016) | The integration of digital technology into all areas of a business fundamentally changes how the business operates and delivers value to customers. It influences various entities including customers, competition, data, innovation, and value. |
| Hanelt et al. (2021) | Organizational change that is triggered and shaped by the widespread diffusion of digital technologies. A firm must radically change the value propositions it pursues within a short period of time, as well as the mindset of its employees. |
| Plekhanov et al. (2023) | Digital transformation is the strategic adoption of digital technologies, allowing firms to bypass traditional competition, disrupt established markets, and create new ones, thereby diminishing the relevance of established firms. |
| IBM (2024) | Digital transformation is a strategic initiative that incorporates digital technology across all areas of an organization. Digital transformation evaluates an organization's processes, products, operations, and technology stack to identify ways to improve operational efficiency and bring products to market faster. |

Descriptive statistics and correlations of narcissism indicators.

| Mean | S.D. | 1 | 2 |
|---------------|------------------------------|---|---|
| 2.51 | 0.83 | | |
| releases 5.96 | 2.97 | 0.12*** | |
| vs 0.25 | 0.11 | 0.18*** | 0.15*** |
| | Mean2.51s releases5.96vs0.25 | Mean S.D. 2.51 0.83 5 releases 5.96 2.97 vs 0.25 0.11 | Mean S.D. 1 2.51 0.83 5 releases 5.96 2.97 0.12*** vs 0.25 0.11 0.18*** |

Note: *** $p \le 0.001$.

Descriptive statistics and correlation coefficients.

| Var | iables | Mean | S.D. | Min. | Max. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-----|---|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|-------|-------|------|
| 1 | MNEs' radical digital innovation (weighted) | 2.15 | 4.38 | 0.04 | 41.19 | | | | | | | | | | | | | | |
| 2 | CEO age (year) | 57.75 | 9.01 | 40.97 | 79.57 | -0.08 | | | | | | | | | | | | | |
| 3 | CEO gender | 0.96 | 0.20 | 0.00 | 1.00 | 0.05 | 0.08 | | | | | | | | | | | | |
| 4 | CEO overseas working experience (year) | 5.79 | 5.42 | 0.00 | 41.66 | 0.05 | 0.24 | 0.04 | | | | | | | | | | | |
| 5 | CEO overseas education experience (year) | 5.11 | 3.37 | 0.00 | 21.50 | 0.08 | 0.17 | 0.05 | 0.20 | | | | | | | | | | |
| 6 | CEO tenure (year) | 6.76 | 1.95 | 1.00 | 25.40 | -0.07 | 0.01 | -0.02 | 0.06 | 0.02 | | | | | | | | | |
| 7 | Board independence (ratio) | 0.47 | 0.25 | 0.25 | 0.80 | 0.11 | 0.02 | 0.02 | 0.03 | 0.03 | 0.01 | | | | | | | | |
| 8 | Board size (log of members of board of directors) | 0.85 | 0.23 | 0.48 | 1.18 | -0.05 | 0.04 | -0.01 | 0.04 | 0.05 | 0.01 | 0.02 | | | | | | | |
| 9 | MNE age (log of year) | 4.91 | 2.31 | 1.53 | 22.11 | 0.12 | 0.27 | 0.00 | 0.25 | 0.17 | 0.04 | 0.05 | 0.03 | | | | | | |
| 10 | MNE size (log of total assets) | 26.76 | 4.23 | 6.65 | 41.93 | 0.06 | 0.00 | 0.04 | 0.05 | 0.00 | 0.00 | 0.04 | 0.02 | 0.01 | | | | | |
| 11 | MNE international experience | 31.64 | 47.87 | 8.13 | 712.50 | -0.07 | 0.17 | -0.02 | 0.42 | 0.47 | 0.03 | 0.02 | 0.04 | 0.17 | 0.04 | | | | |
| 12 | MNE R&D intensity (%) | 2.77 | 1.85 | 0.02 | 11.00 | 0.09 | 0.07 | 0.03 | 0.03 | -0.02 | 0.01 | 0.04 | -0.03 | 0.06 | 0.23 | 0.04 | | | |
| 13 | MNE cultural diversity (weighted) | 0.66 | 0.21 | 0.03 | 1.71 | 0.33 | -0.02 | 0.01 | 0.04 | 0.05 | 0.01 | 0.05 | -0.02 | 0.02 | 0.34 | 0.13 | 0.05 | | |
| 14 | CEO narcissism | 0.09 | 0.45 | 0.01 | 6.08 | 0.06 | -0.03 | 0.01 | 0.06 | 0.03 | -0.03 | 0.02 | -0.12 | 0.11 | 0.04 | 0.04 | 0.03 | -0.02 | |
| 15 | Subsidiary TMT international diversity | 0.83 | 0.31 | 0.01 | 1.00 | 0.05 | 0.03 | -0.01 | -0.01 | -0.07 | 0.11 | -0.02 | 0.03 | 0.03 | 0.00 | -0.04 | -0.08 | -0.01 | 0.00 |

Notes: N = 3,064. Correlation coefficient above 0.036 or below -0.036 is significant at p < 0.05, and that above 0.047 or below -0.047 is significant at p < 0.01.

Results of panel regression with random-effects model for MNEs' radical digital innovation.

| DV: MNE's radical digital innovation (weighted by total employees) | Нуро. | Model 1 | | | I | Model 2 | | Model 3 | | |
|---|-------|---------|-------|-------|---------|---------|-------|---------|-------|-------|
| Variables | | Coef. | SE | Sig. | Coef. | SE | Sig. | Coef. | SE | Sig. |
| CEO narcissism | H1 | | | | 0.257 | 0.125 | 0.040 | 0.276 | 0.125 | 0.027 |
| Subsidiary TMT international diversity | H2 | | | | 1.220 | 0.187 | 0.000 | 1.819 | 0.217 | 0.000 |
| CEO narcissism x Subsidiary TMT international diversity | Н3 | | | | | | | -2.705 | 0.502 | 0.000 |
| CEO age (year) | | -0.002 | 0.013 | 0.857 | -0.004 | 0.013 | 0.744 | -0.003 | 0.013 | 0.825 |
| CEO gender | | 0.268 | 0.292 | 0.358 | 0.276 | 0.290 | 0.342 | 0.350 | 0.289 | 0.226 |
| CEO overseas working experience (year) | | 0.077 | 0.016 | 0.000 | 0.076 | 0.016 | 0.000 | 0.062 | 0.016 | 0.000 |
| CEO overseas education experience (year) | | 0.004 | 0.067 | 0.947 | 0.059 | 0.067 | 0.373 | 0.094 | 0.067 | 0.157 |
| CEO tenure (year) | | -0.004 | 0.029 | 0.891 | -0.042 | 0.030 | 0.159 | -0.047 | 0.029 | 0.114 |
| Board independence (ratio) | | 1.436 | 0.234 | 0.000 | 1.435 | 0.233 | 0.000 | 1.446 | 0.231 | 0.000 |
| Board size=log (members of the board of directors) | | -1.623 | 0.288 | 0.000 | -1.343 | 0.290 | 0.000 | -1.233 | 0.289 | 0.000 |
| MNE age=log (years since establishment) | | 0.167 | 0.050 | 0.001 | 0.162 | 0.050 | 0.001 | 0.155 | 0.050 | 0.002 |
| MNE size=log (total assets) | | 0.139 | 0.015 | 0.000 | 0.139 | 0.015 | 0.000 | 0.139 | 0.014 | 0.000 |
| MNE international experience | | -0.008 | 0.005 | 0.123 | -0.004 | 0.005 | 0.380 | -0.002 | 0.005 | 0.718 |
| MNE R&D intensity (%) | | 0.086 | 0.032 | 0.006 | 0.104 | 0.032 | 0.001 | 0.096 | 0.031 | 0.002 |
| MNE cultural diversity (weighted) | | 12.624 | 0.314 | 0.000 | 12.594 | 0.312 | 0.000 | 12.781 | 0.313 | 0.000 |
| Inverse Mills ratio | | -0.060 | 0.001 | 0.000 | -0.061 | 0.001 | 0.000 | -0.061 | 0.001 | 0.000 |
| Adjusted R-squared | | 0.5968 | | | | 0.6091 | | 0.6099 | | |
| Wald chi2 | | 3135.67 | , | 0.000 | 3227.33 | | 0.000 | 3286.11 | | 0.000 |

Notes: N = 3,064. Firm, industry and year fixed effects are included in the estimation. Unstandardized coefficients are reported. The *p* values are based on two-tailed tests.