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How does CEO–TMT exchange quality incongruence affect business model innovation? The moderating role of environmental dynamism

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Abstract

In today's dynamic business environment, business model innovation (BMI) has become a strategic lever that businesses can harness to unlock new revenue opportunities and fortify their long-term competitive edge. BMI often hinges on the exchange relationships between chief executive officers (CEOs) and their top management team (TMT) members. However, in practice, CEOs and TMT members often have incongruent perceptions of these relationships, which may impede them from making joint efforts to achieve BMI. When such incongruence arises, relying solely on either the CEO's or the TMT members' perceptions of exchange quality might provide an incomplete understanding of the effect of CEO–TMT exchange quality on BMI. In this study, we investigate how CEO–TMT exchange quality incongruence influences BMI under various levels of environmental dynamism. Using archival industry data and matched survey data from 618 CEOs and 1854 TMT members in China, the polynomial regression and response surface analyses indicate that CEO–TMT exchange quality incongruence negatively affects BMI. This finding suggests that while high perceptions of exchange quality by both CEOs and TMTs independently contribute to BMI, an incongruent perception of exchange quality between CEOs and TMT members can undermine the success of BMI. Moreover, high levels of environmental dynamism aggravate the negative effect of CEO–TMT exchange quality incongruence on BMI. These findings enable us to offer new theoretical insights regarding the influence of the CEO–TMT exchange quality on BMI, thus complementing existing studies on antecedents of BMI and enriching literature on the outcomes of the CEO–TMT interface. Additionally, this study offers practical guidance for enhancing BMI through effective management of incongruent perceptions of CEO–TMT exchanges.

KEYWORDS

business model innovation, CEO–TMT exchange quality incongruence, environmental dynamism

1 | INTRODUCTION

A business model, defined as a system of activities performed by the focal firm and its partners to create and capture values (Snihur & Zott, 2020; Zott & Amit, 2010), has been viewed as a critical way to transform entrepreneurial opportunities into viable businesses (Leppänen et al., 2023). It depicts the design of activity content, structure, and governance (Amit & Zott, 2012) to determine a firm's business logic for satisfying market needs (Hock-Doepgen et al., 2020). In the face of fierce market competition and fast-changing customer demand, firms innovate their business models to secure competitive advantages (Klein et al., 2021). Researchers recognize business model innovation (BMI), or the novel changes to essential elements of the business model or ways of linking these elements (Foss & Saebi, 2017; Snihur & Zott, 2020; Volberda et al., 2018), as a powerful tool to develop new revenue streams and build long-standing competitiveness (Amit & Zott, 2012). For example, by analyzing subscriber data and collaborating with series producers, Netflix has innovated its business model from solely offering online video streaming to creating original content that caters to subscriber preferences (Correani et al., 2020).

Despite its significance, BMI often encounters substantial challenges such as path dependency and organizational inertia (Huang et al., 2013; Laudien & Daxböck, 2016; Vatankhah et al., 2023). These challenges lead firms to be insensitive to environmental changes and fail to collect adequate information to take conscious actions for seizing BMI opportunities (Chesbrough, 2010; Vatankhah et al., 2023). In such situations, chief executive officers (CEOs) and the rest of the top management team (TMT) members emerge as pivotal figures in addressing challenges associated with BMI (Colovic, 2021; Doz & Kosonen, 2010; Liu et al., 2023). CEOs are often the chief designers and primary decision makers of BMI, whereas TMT members provide commitment, strategic advice, and managerial effort to promote BMI (Narayan et al., 2021; Simsek et al., 2018). High CEO–TMT exchange quality, or the quality of the dyadic relationships between CEOs and their TMT members (Lin & Rababah, 2014), can promote timely information and knowledge exchange to break group thinking and generate new insights (Lin & Lin, 2019; Lin & Rababah, 2014). This, in turn, facilitates wise decision-making and encourages collaborative efforts toward sensing and seizing opportunities to achieve BMI (Clauss et al., 2019; Doz & Kosonen, 2010). For example, the exchange relationship between Amazon's CEO, Jeff Bezos, and his TMT members has greatly contributed to the company's BMI success (Eugene, 2019).

Practitioner points

- CEO–TMT exchange quality incongruence hinders CEOs' and their top management team (TMT) members' joint decision-making and concerted efforts for business model innovation (BMI).
- CEOs should display trust and care for TMT members and resolve incongruent exchange quality perceptions to build strong socio-emotional relationships with TMT members.
- When firms pursue BMI in highly dynamic environments, CEOs and TMT members should prioritize the realization of congruent and high CEO–TMT exchange quality.

However, in practice, CEOs and TMT members rarely see eye to eye in their exchange relationships due to poor communication, unrealistic optimism, and perceptual biases (Loignon et al., 2019), resulting in incongruent CEO–TMT exchange quality. CEO–TMT exchange quality incongruence refers to the extent to which CEOs and TMT members perceive different levels of exchange quality (Graen & Uhl-Bien, 1995; Lin & Rababah, 2014). This incongruence occurs in two forms: CEOs perceive either (1) higher or (2) lower CEO–TMT exchange quality than TMT members. When CEOs perceive higher CEO–TMT exchange quality than TMT members, they consider their relationship with TMT members as socio-emotional, whereas TMT members view the relationship as transactional (Matta et al., 2015). As a result, TMT members may only carry out their duties as assigned and withhold the substantial efforts that contribute to BMI (Wang et al., 2005). This incongruence may, in turn, prevent CEOs from providing adequate resources and decision-making latitude to TMT members (Matta et al., 2015), thereby damaging BMI. In contrast, when CEOs perceive lower CEO–TMT exchange quality than TMT members, they may provide TMT members with limited or inadequate resources and psychological support (Liden et al., 1997; Matta et al., 2015), which will lessen TMT members' enthusiasm for BMI (Sherman et al., 2012). Although CEO–TMT exchange quality incongruence is common (Sin et al., 2009), its effect on BMI is still underexplored.

Specifically, two significant research gaps exist in the literature. First, although recent BMI studies have revealed the significance of upper echelons, including CEOs and TMT members (Bhatti et al., 2021; Cillo et al., 2021), they have primarily focused on exploring the effects of either CEO characteristics (e.g., CEO leadership

style; Colovic, 2021) or the collective attributes of both CEOs and their TMT members (e.g., ideological diversity; Narayan et al., 2021). The role of CEO–TMT exchange quality incongruence in BMI remains largely underexplored. Second, although existing CEO–TMT interface studies have provided insights into the impact of TMT-perceived CEO–TMT exchange quality on strategic decision-making quality (Lin & Rababah, 2014) and competitive propensity (Lin & Lin, 2019), they have assumed CEOs and TMT members have similar perceptions of their exchange quality and ignored the possibility of incongruence among their perceptions of CEO–TMT exchange quality. When such incongruence occurs, the explanatory effects of either CEOs' or TMT members' perceived exchange quality are incomplete and possibly misleading (Chaudhry et al., 2020). As such, it is crucial to consider both CEOs' and TMT members' perceptions of their exchange quality and examine the effect of CEO–TMT exchange quality incongruence on BMI. In sum, we aim to answer the overall research question: (1) *What is the effect of CEO–TMT exchange quality incongruence on BMI?*

Furthermore, CEOs and TMT members are embedded in industrial environments, with different impacts and constraints on organizations (Jansen et al., 2009). Existing studies have recognized the importance of considering environmental dynamism when exploring the antecedents and outcomes of BMI (Pati et al., 2018; Yuan et al., 2021). Environmental dynamism, defined as the rate and degree of changes in an industry (Dess & Beard, 1984; Richard et al., 2019), is a vital boundary condition in CEOs' and TMT members' influence on strategic outcomes (Mammassis & Kostopoulos, 2019). Richard et al. (2019) found that environmental dynamism can moderate the relationships between TMT members' demographic fault lines and strategic changes. Given this, the effect of CEO–TMT exchange quality incongruence on BMI may vary under different levels of environmental dynamism. For example, in highly dynamic environments, CEOs and TMT members can suffer challenges, including greater information processing burdens and decision-making ambiguity, particularly regarding responsive actions that facilitate BMI (Heavey et al., 2010). These challenges can negatively affect CEOs' and TMT members' information processing outcomes and collective efforts in innovating business models, which can influence the relationship between CEO–TMT exchange quality incongruence and BMI. However, evidence on the influence of the CEO–TMT interface on BMI under various levels of environmental dynamism is limited. Hence, our second research question is as follows: (2) *What is the*

effect of CEO–TMT exchange quality incongruence on BMI at different levels of environmental dynamism?

To answer the questions previously mentioned, we draw on the leader–member exchange (LMX) theory (Bauer et al., 1996; Dulebohn et al., 2012), which emphasizes the dyadic interactions between leaders and members following the norm of reciprocity (Bauer et al., 1996; Graen & Uhl-Bien, 1995). LMX theory accounts for the influence of CEO–TMT exchange quality from a dyadic view of CEOs and TMT members and complements the single perspective taken by existing studies (Lin & Lin, 2019). In line with LMX theory, incongruence in LMX quality perceptions can lead to tension between leaders and members and impede their effective resource exchange and mutual support, which impacts team and organizational outcomes (Chaudhry et al., 2020; Matta et al., 2015; Sherman et al., 2012). Accordingly, we propose that CEO–TMT exchange quality incongruence will negatively affect BMI. Furthermore, the contexts in which leaders and members are embedded may influence the effect of LMX, as suggested by LMX theory (Bernerth et al., 2016; Liden et al., 1997). As such, we predict the negative effect of CEO–TMT exchange quality incongruence on BMI will be moderated by environmental dynamism. We tested our research model using the polynomial regression and response surface analysis in combination with archival industry data and matched survey data from 618 CEOs and 1854 TMT members in China.

With this study, we contribute to the literature in three key ways. First, we extend the existing research on antecedents of BMI from an upper-echelon perspective by theoretically and empirically revealing the influence of CEO–TMT exchange quality incongruence on BMI. Prior studies have recognized the significance of upper echelons for BMI but have only focused on the effects of either CEOs' traits or collective characteristics of both CEOs and TMT members (e.g., Colovic, 2021; Snihur & Zott, 2020), disregarding the role of CEO–TMT interface. In this study, we reveal the effect of CEO–TMT exchange quality incongruence (i.e., as a manifestation of the CEO–TMT interface) on BMI, thus improving knowledge of the influence of upper echelons on BMI. Second, we provide new insights into CEO–TMT exchange quality literature by investigating both CEOs' and TMT members' perceptions of exchange quality. Although existing studies have focused solely on TMT-perceived CEO–TMT exchange quality (Lin & Lin, 2019; Lin & Rababah, 2014), we follow LMX theory to incorporate both CEO- and TMT-perceived CEO–TMT exchange quality and investigate how CEO–TMT exchange quality incongruence influences BMI. The results indicate that any incongruence of exchange quality perceptions from CEOs and

TMT members will damage BMI. Third, we address recent calls for critical considerations of environmental boundary conditions in explorations of the CEO–TMT interface (Georgakakis et al., 2022) by analyzing the moderating effect of environmental dynamism. Our research thus enriches studies on the essential aspects of environmental dynamism in shaping BMI (Pati et al., 2018; Yuan et al., 2021) by revealing that environmental dynamism amplifies the negative influence of CEO–TMT exchange quality incongruence on BMI.

2 | THEORETICAL BACKGROUND

2.1 | Business model innovation

A business model depicts an activity system that spans multiple boundaries and determines how firms create and capture value with suppliers, customers, and partners (Snihur & Zott, 2020; Zott & Amit, 2010). Business models involve three primary design elements: content, structure, and governance (Zott & Amit, 2010). Content refers to activities executed within the system, structure refers to how these activities are connected, and governance refers to who executes the activities (Zott & Amit, 2010). Firms can conduct BMI by introducing new activities (i.e., new content), connecting activities in new ways (i.e., new structures), and changing which partners execute activities (i.e., new governance; Amit & Zott, 2012).

Given its benefits (Schrauder et al., 2018), recent studies have explored the antecedents of BMI from institutional, strategic, and operational perspectives (Bocken & Geradts, 2020; Guo et al., 2020; Klein et al., 2021). Existing upper-echelon literature has indicated that top managers, especially CEOs, are the primary designers of the business models that account for BMI (Cillo et al., 2021; Snihur & Zott, 2020). In this regard, some scholars have examined the effect of CEO attributes on BMI (Snihur & Zott, 2020). Colovic (2021), for example, revealed that empowering CEO leadership can significantly facilitate BMI. Because of bounded rationality, however, CEOs alone are unlikely to address the complexity associated with BMI comprehensively. Scholars have thus examined the influence of top executives' collective attributes on BMI (Frankenberger & Sauer, 2019; Narayan et al., 2021) by treating CEOs as members of TMT members to average their attributes to TMT composition holistically. However, these studies have overlooked that BMI's complexity often requires CEOs to make joint decisions with TMT members and pool concerted efforts (Doz & Kosonen, 2010). As the key studies listed in Table 1 suggest, the influence of CEO–TMT interactions on BMI remains underexplored.

The existing literature suggests that CEO–TMT interactions may shape collective decision-making in strategic tasks like business model design (Simsek et al., 2018). Although CEOs and TMT members play different roles in strategic activities (Liu et al., 2021; Simsek et al., 2018; Talke et al., 2011; see supplementary Appendix 1), they interact with one another to realize novel opportunities for BMI and collaboratively execute related activities. For example, as strategic leaders of TMT members, CEOs may integrate TMT members' diverse information and knowledge to identify emerging BMI opportunities and evaluate TMT members' suggestions (Buyl et al., 2011). TMT members can then analyze BMI opportunities based on their professional expertise and provide feedback related to the implementation of novel business models (Doz & Kosonen, 2010). In this way, effective CEO–TMT interactions facilitate resource integration and enable CEOs and TMT members to improve BMI collectively (Doz & Kosonen, 2010). As such, in the present study, we focus on CEO–TMT interactions and investigate the role of CEO–TMT exchange quality in BMI.

2.2 | Leader–member exchange theory and CEO–TMT exchange quality incongruence

LMX theory emphasizes the dyadic nature of the exchange relationships between leaders and members based on the norm of reciprocity (Bauer et al., 1996; Graen & Uhl-Bien, 1995). Thus, it is “a theory of dyadic (leader–member) interaction” (Schriesheim et al., 2001, 516). Based on LMX theory, LMX affects the team process and outcomes by shaping the behaviors of leaders and members (Kim et al., 2022; Le & González-Romá, 2012). Specifically, leaders possess positional resources that allow them to provide social support and significant decision-making autonomy to team members (Liden et al., 1997). Upon receiving favors from leaders, team members may demonstrate commitment to their leaders by investing extra job efforts (Dulebohn et al., 2012). Accordingly, effective LMX can facilitate leaders and members to achieve superior team performance (Kim et al., 2022). The literature suggests LMX quality can range from low to high (Gerstner & Day, 1997). Low-quality LMX indicates transactional exchanges between leaders and members primarily based on employment contracts, suggesting low levels of trust and limited resources for exchange and support (Liden et al., 1997). In contrast, high-quality LMX indicates effective socio-emotional exchange between leaders and members that extends beyond a transactional nature (Bauer et al., 1996) and reflects resource sharing and mutual consideration (Dienesch & Liden, 1986; Maslyn & Uhl-Bien, 2001).

TABLE 1 Key studies on the antecedents of business model innovation and outcomes of CEO–TMT exchange quality.

Source	Antecedents	Moderator	Outcome	Research method	Key findings
Group A: Key studies on the antecedents of BMI from upper-echelon views					
Narayan et al. (2021)	TMT cognitive and ideological diversity	TMT longevity	BMI attention scope and intensity	Panel data from 23 US printing and publishing firms	TMT cognitive diversity enhances BMI attention scope and intensity, whereas TMT ideological diversity has an inverted U-shaped effect on BMI attention intensity.
Cillo et al. (2021)	CEO–consumer interaction		BMI	Conceptual study	CEO–consumer interaction increases the likelihood of BMI.
Snihur and Zott (2020)	Founders' thinking patterns and behaviors		BMI	Case study	Founders' search behavior, thinking style, and decision-making patterns can affect ventures' BMI.
Frankenberger and Sauer (2019)	TMT's attention patterns		Business model design	Case study	TMT's combination of external focus on distant business methods and external cooperative activities triggers novelty-centered business model design.
Group B: Key studies on the influence of CEO–TMT exchange quality					
Lin and Rababah (2014)	TMT-perceived CEO–TMT exchange quality		TMT psychological empowerment and decision quality	Survey of 210 firms from Jordan	CEO–TMT exchange quality enhances TMT psychological empowerment and ultimately decision quality.
Lin and Lin (2019)	TMT-perceived CEO–TMT exchange level	CEO–TMT exchange differentiation	Competitive propensity and firm performance	Survey of 131 firms from Taiwan	CEO–TMT exchange level has a positive effect on competitive propensity and ultimately firm performance, which is weakened by CEO–TMT exchange differentiation.
This research	CEO–TMT exchange quality incongruence	Environmental dynamism	BMI	Multiple-respondent survey from 618 CEOs and 1854 TMT members	CEO–TMT exchange quality incongruence negatively affects BMI. BMI is lower when CEOs perceive lower rather than higher exchange quality than TMT members. Environmental dynamism aggravates the negative effects of CEO–TMT exchange quality incongruence on BMI.

Our model addresses the following gaps in prior knowledge:

1. Although BMI studies revealed the importance of upper echelons such as CEOs and TMT members for BMI, they investigated the effects of either CEO characteristics or whole TMT attributes and ignored the role of CEO–TMT interactions such as their exchange quality in BMI.
2. Existing CEO–TMT interface studies assumed CEOs and TMT members have similar perceptions of their exchange quality and ignored that such perceptions can be incongruent.
3. The literature lacks an understanding of how CEO–TMT exchange quality incongruence influences BMI under various levels of environmental dynamism.

Abbreviations: BMI, business model innovation; TMT, top management team.

The LMX literature further indicates that leaders and members can perceive LMX quality congruently (i.e., both parties' perceptions of high or low levels), or they can hold incongruent views of LMX quality due to insufficient communication or perceptual bias (Loignon et al., 2019). LMX incongruence is a more common phenomenon than LMX congruence (Sin et al., 2009). It occurs in two forms: leaders may perceive (1) higher or (2) lower LMX quality than members. Although leaders enjoy positions of power, members can “either reject, embrace, or renegotiate roles prescribed by their leaders” (Wang et al., 2005, 421). Both leaders and members form perceptions of their dyadic exchange relationships, which affect their reactions to such relationships (Lewin, 2013). According to LMX theory, LMX incongruence causes leaders and members to perceive others to deviate from the reciprocity norm that is based on equivalent and immediate returns, resulting in tension in their exchange relationship (Cogliser et al., 2009; Sparrowe & Liden, 1997). This tension can lead to limited resource exchange and a lack of mutual support between leaders and their members (Chaudhry et al., 2020; Sherman et al., 2012). For instance, when LMX incongruence occurs, leaders or members may choose to withhold important resources and may be less motivated to invest their time and effort in assisting others, thereby impacting team and organizational outcomes (Lin & Lin, 2019; Matta et al., 2015; Sherman et al., 2012).

In this study, LMX theory provides an appropriate perspective for investigating the influence of CEO–TMT exchange quality incongruence on BMI. According to LMX theory, CEO–TMT exchange quality is a specific type of LMX at the upper-echelon level because CEOs are the leaders of TMT members (Lin & Rababah, 2014). CEO–TMT exchange quality incongruence reflects situations in which CEOs and TMT members perceive their exchange relationship differently. Grounded in LMX theory, CEO–TMT exchange quality incongruence may influence firms' goal realization. Figure 1 provides a visual simplification of the nature of CEO–TMT exchange quality incongruence that we examine with the polynomial regression and response surface analysis (Edwards & Parry, 1993). The matrix provides a straightforward graphical depiction of our arguments. Quadrant 1 and Quadrant 4 reflect two forms of CEO–TMT exchange quality incongruence: Quadrant 1 represents CEO–TMT exchange quality incongruence wherein CEOs view the exchange relationship with TMT members as socio-emotional and perceive higher CEO–TMT exchange quality than TMT members, and Quadrant 4 represents CEO–TMT exchange quality incongruence wherein CEOs view the exchange relationship with TMT members as transactional and perceive lower CEO–TMT exchange quality than TMT members. When CEOs' and

TMT members' perceptions of their exchange quality are incongruent, resource exchange between them will be unequal and largely ineffective (Chaudhry et al., 2020; Matta et al., 2015). In this situation, it is difficult for the two parties to collaborate effectively, making joint decisions regarding BMI.

In contrast, Quadrants 2 and 3 highlight CEO–TMT exchange quality congruence, Quadrant 2 represents CEO–TMT exchange quality congruence at high levels (i.e., both CEOs and TMT members evaluate their relationship as high quality or socio-emotional), and Quadrant 3 represents CEO–TMT exchange quality congruence at low levels (i.e., both CEOs and TMT members perceive their relationship as low-quality or transactional). Because CEO–TMT exchange quality incongruence is more common than congruence, we primarily focus on the effect of CEO–TMT exchange quality incongruence on BMI. Yet we examine the impact of CEO–TMT exchange quality congruence in a post hoc analysis.

Despite the importance of previous CEO–TMT exchange quality studies, they primarily investigated the influence of TMT-perceived CEO–TMT exchange quality on strategic decision-making (Lin & Rababah, 2014) and firm competitive behaviors (Lin & Lin, 2019). They have assumed CEOs and TMT members hold similar perceptions of their exchange quality and largely ignored the dyadic nature of CEO–TMT exchange quality (Lin & Rababah, 2014). When CEOs and TMT members view their exchange relationship incongruently, investigating the effects of either CEOs' or TMT members' exchange quality on BMI may be incomplete and possibly misleading. Therefore, it is necessary to examine the influence of CEO–TMT exchange quality incongruence on BMI further.

3 | HYPOTHESES

In the following sections, we will discuss the relationship between CEO–TMT exchange quality incongruence and BMI. Then we will explore the effect of CEO–TMT exchange quality incongruence on BMI at different levels of environmental dynamism (see Figure 2 for our research model).

3.1 | CEO–TMT exchange quality incongruence and BMI

According to LMX theory, the CEO–TMT exchange relationship hinges on the resources CEOs and TMT members offer one another (Liden et al., 1997). In any form of CEO–TMT exchange quality incongruence (Quadrant

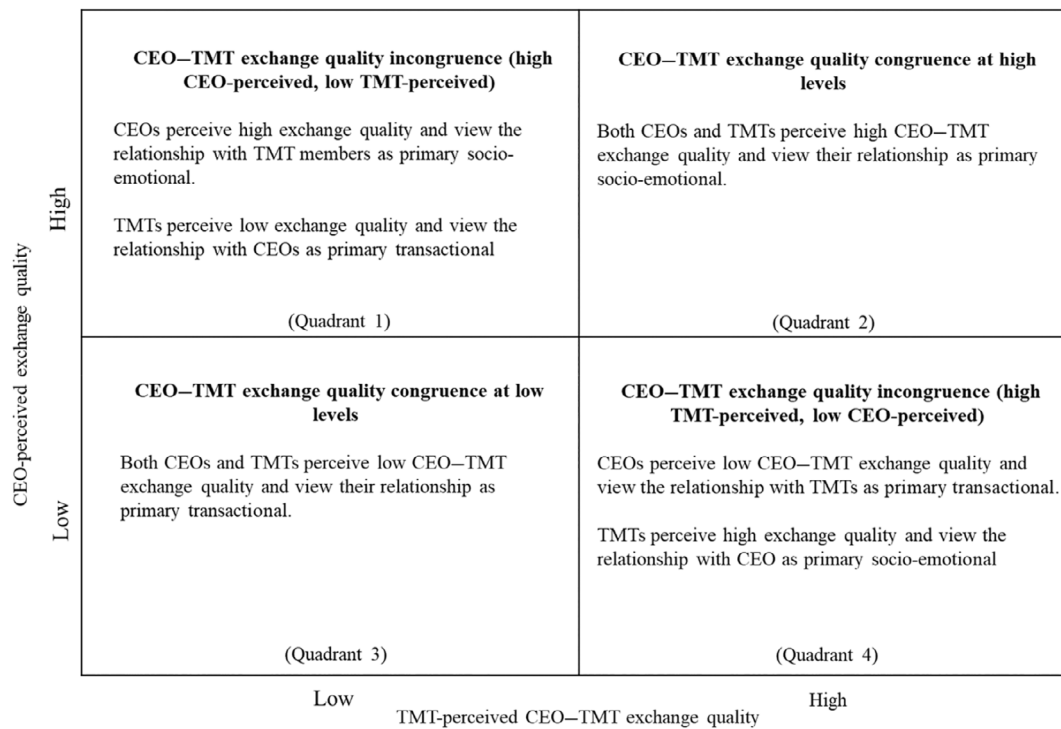


FIGURE 1 Two-by-two matrix representing CEO–TMT exchange quality incongruence and congruence. TMT, top management team.

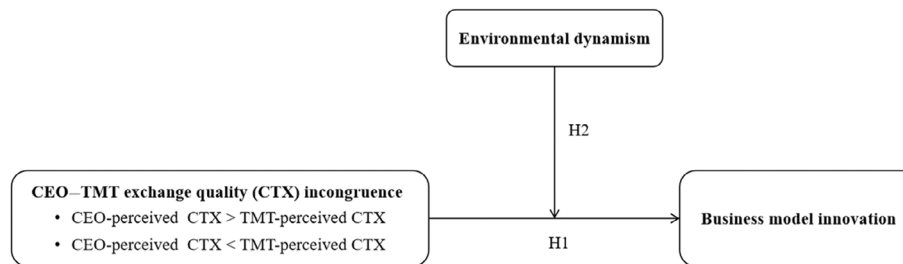


FIGURE 2 Research model. CCTX, CEO-perceived CEO–TMT exchange quality; TCTX, TMT-perceived CEO–TMT exchange quality; TMT, top management team.

1 or Quadrant 4), CEOs and TMT members may not exchange resources valued by the other and, thereby, cannot effectively collaborate to realize BMI. Specifically, we propose that CEO–TMT exchange quality incongruence can affect BMI in terms of content, structure, and governance for the following reasons. First, innovating business model content requires CEOs and TMT members to utilize various forms of market information to identify and satisfy new customer needs via the addition of novel value creation activities (Amit & Zott, 2012). According to LMX theory, under incongruent exchange quality, CEOs and TMT members tend to withhold market information (Lin & Lin, 2019) because of uncertainty and disconnected feelings that arise from the incongruence. This can hinder the pooling of the resources and insights necessary for satisfying customer needs with the

timely introduction of new business model content (Hock-Doeppen et al., 2020). In sum, CEO–TMT exchange quality incongruence can impede business model content innovation.

Second, LMX theory holds that CEO–TMT exchange quality incongruence can impede open communication and discussion between CEOs and TMT members, thus negatively affecting business model structure innovation. Given that CEOs and TMT members oversee different business units and activities (Chesbrough, 2007), their functional expertise is complementary. However, CEO–TMT exchange quality incongruence can limit the exchange of functional knowledge, making it difficult to gain a comprehensive understanding of the business model structure that, in turn, can hinder the generation of novel business activity linkages. Therefore, CEO–TMT

exchange quality incongruence can hinder business model structure innovation.

Third, in line with LMX theory, when CEOs and TMT members disagree on the nature of their exchange relationship (i.e., socio-emotional or transactional relationship; Dulebohn et al., 2012), the party that perceives lower exchange quality tends to withhold rather than share interpersonal ties beyond the organization (Sherman et al., 2012; Sparrowe & Liden, 1997). This makes it difficult to utilize informal social networks that may significantly enrich a firm's potential partner pool. Such a potential partner pool is crucial for business model governance innovation. Thus, CEO–TMT exchange quality incongruence is detrimental to the innovation of business model governance. In conclusion, we propose the following:

Hypothesis 1. CEO–TMT exchange quality incongruence will negatively influence BMI.

3.2 | Moderating role of environmental dynamism

Environmental dynamism refers to the rate and unpredictability of changes in an industry (Dess & Beard, 1984; Richard et al., 2019). Dynamic environments are characterized by rapid and unpredictable changes in customer preferences, technology developments, and competitive dynamics (Heavey et al., 2010; Richard et al., 2019). Although such changes can generate technological and market opportunities, they are challenging to forecast and can quickly make organizational inputs obsolete (Heavey et al., 2010). Existing studies have explored the influence of environmental dynamism on BMI (Yuan et al., 2021). Pati et al. (2018), for example, suggested dynamic environments can strengthen the positive effect of BMI on firm performance. However, the current understanding of the relationship between CEO–TMT exchange quality and BMI under various levels of environmental dynamism remains notably limited. Dynamic environments create uncertainties in strategic decision-making—particularly regarding responses to potential outcomes—that can create significant challenges for CEOs and TMT members attempting to lead BMI. Such uncertainties impose information processing burdens on managers, requiring them to gather, track, and analyze large amounts of information to adapt to changing environments, and top managers are likely to experience significant work-related anxiety and stress as a result (Hambrick et al., 2005). Prior studies have suggested LMX relationships can affect how leaders and members experience environmental uncertainty because they are

proximal information sources to each other (Rosen et al., 2011). Thus, CEO–TMT exchange quality and environmental dynamism may jointly affect BMI.

Existing research indicates the effect of LMX can be determined by the contexts in which leaders and members are embedded (Bernerth et al., 2016; Liden et al., 1997). In line with this view, we propose that the negative effect of CEO–TMT exchange quality incongruence on BMI will be more substantial in dynamic environments than in stable ones. Low environmental dynamism tends to lower CEOs' and TMT members' information processing burdens and generate lower uncertainty (Baron & Tang, 2011). Under such conditions, decision-making outcomes can also become more predictable (Hambrick et al., 2015). Moreover, despite insufficient resource exchange, CEOs and TMT members with incongruent exchange quality are less likely to engage in biased BMI decision-making. Given this, the adverse effect of CEO–TMT exchange quality incongruence on BMI may be challenging to discern when environmental dynamism is low.

In contrast, when environmental dynamism is high, the adverse effect of CEO–TMT exchange quality incongruence tends to increase. Dynamic environments widen discrepancies between existing and expected business models (Yuan et al., 2021), which places burdensome demands on both CEOs and TMT members to rapidly process and integrate information and knowledge for BMI (Doz & Kosonen, 2010). In other words, dynamic environments increase the value of ensuring effective exchange between CEOs and TMT members for BMI. According to LMX research, when environmental dynamism is high, CEOs and TMT members who perceive high exchange quality tend to seek information from one another to cope with uncertainty (Rosen et al., 2011; Simsek et al., 2018). However, in cases of CEO–TMT exchange quality incongruence, CEOs and TMT members often cannot meet the other's demands (Gerstner & Day, 1997; Liden et al., 1997). The resulting limited exchange of insights and knowledge can impede the timely processing of discrepant information and conflicting signals in dynamic environments (Hambrick et al., 2005), ultimately damaging BMI (Liu et al., 2021). When this occurs, CEOs' and TMT members' sense of psychological safety regarding risky activities decreases and prevents both parties from taking the necessary risks to achieve BMI (Doz & Kosonen, 2010; Heavey & Simsek, 2013; Lin & Rababah, 2014). Accordingly, we propose the following:

Hypothesis 2. Environmental dynamism will moderate the negative relationship between CEO–TMT exchange quality

incongruence and BMI, such that high environmental dynamism will amplify the negative effect of CEO–TMT exchange quality incongruence on BMI.

4 | METHODOLOGY

4.1 | Sample and data collection

To test the proposed research model, we conducted a multirespondent survey and collected archival data from the Chinese Yangtze River Delta region. This region is the most economically developed area in China and contributed approximately 25% of the national GDP in 2020. It is a well-suited context for the purposes of this study, given that it is a hotbed for developing new technologies and industry reinvention (Dai et al., 2018). Specifically, top managers in the Yangtze River Delta region frequently and actively engage in BMI activities to increase the global competitiveness of their firm.

Given the difficulties of collecting data in China, we worked closely with a local administrative institution that oversees industrial development and studies enterprise development for policy purposes. The institution provided a sample pool of 1700 firms from various industries (e.g., machinery manufacturing, chemical) of varying sizes, ages, and financial performance. The institution also granted access to archival data on the contractual, demographic, and financial information of the firms. The process for doing so began with the institution issuing CEOs and TMT members a formal invitation to respond to the survey voluntarily at the beginning of 2018. We then identified top managers in strategic decision-making in three positions (Lo & Fu, 2016; Marcel, 2009; Nath & Mahajan, 2008). We chose the following three positions for their close association with BMI: marketing managers, who lead firms in customer interactions and help them understand what customers need; operation managers, who lead the development of new products and services, which is crucial to BMI activities; and administration managers, who coordinate among various departments to support BMI. We then contacted the firms and invited their CEOs, marketing managers, operation managers, and administration managers to participate in the survey.

We specified that the CEOs, who have high-level professionalism and a holistic perspective of a firm's business model, would complete the BMI questions. Both CEOs and their TMT members completed the questions pertaining to the CEO–TMT exchange quality. Given that these questions involved relationship evaluation, respondents would possibly fear any potential negative

consequences of their responses. To reassure the CEOs and TMT members and to avoid issues related to self-preservation and social desirability, we promised their responses would be confidential and maintained separately.

After sending the questionnaire, we conducted follow-up phone calls to improve the response rate. We merged survey responses from CEOs and TMT members and obtained completed data from 618 firms, including responses from 618 CEOs and 1854 TMT members, resulting in an effective response rate of 36.353%. In considering the potential for nonresponse bias, we compared the firm characteristics of responding and nonresponding groups and found no significant differences between them ($t = 1.081$, $p = 0.280$ for employee numbers; $t = -1.580$, $p = 0.114$ for firm age; and $\chi^2(6) = 6.993$, $p = 0.322$ for industry type). As such, nonresponse bias was not a significant problem in this study.

We compiled archival data from the China Stock Market & Accounting Research Database (CSMAR) database to measure environmental dynamism. The CSMAR database provides financial data on China's listed companies and has been widely used in empirical research (e.g., Richard et al., 2019). We then extracted the financial information of listed firms from 2012 to 2017 to calculate the environmental dynamism of 2017 (see supplementary Appendix 2 for the descriptive characteristics of sample firms and respondents).

4.2 | Variables and measures

We adapted the scale items used in this study from previously validated measures. The original questionnaire was developed in English and then translated into Chinese using the back-translation method to validate accuracy (Brislin, 1980). Four academic researchers from the strategic management field reviewed the questionnaire. Based on their suggestions, we reworded some items to align with business practices in China, and then we pilot-tested the questionnaire with 30 M.B.A. students, modifying redundant or ambiguous items according to their feedback (see supplementary Appendix 3 for the measures).

Business model innovation. We measured BMI using a six-item scale adapted from Zott and Amit (2007). The items capture novel changes to business model elements or ways of connecting these elements (Foss & Saebi, 2017; Snihur & Zott, 2020). We invited CEOs to evaluate the overall novelty and novelty of key elements of business models.

CEO- and TMT-perceived CEO–TMT exchange quality. We measured CEO–TMT exchange quality using a five-

item scale adapted from Lin and Rababah (2014) and Graen and Uhl-Bien (1995). Both CEOs and TMT members evaluated their perceived exchange quality. Specifically, CEO-perceived exchange quality captured exchange quality from the CEOs' perspective; CEOs evaluated the extent to which they understand TMT members' needs and problems, their work relationship with TMT members, their confidence in the TMT's competence, and other supports provided to TMT members (Lin & Rababah, 2014). Similarly, the measure of TMT-perceived CEO-TMT exchange quality was parallel with CEO-perceived CEO-TMT exchange quality (Graen & Uhl-Bien, 1995). Alternately, we invited TMT members to assess the exchange relationship with their CEOs, and we thus measured TMT-perceived exchange quality as the mean score of individual TMT members' responses (Lin & Rababah, 2014).

Environmental dynamism. In line with the existing literature, we operationalized environmental dynamism with industry sales (Keats & Hitt, 1988; Richard et al., 2019). Because we conducted the survey at the beginning of 2018, we used the values of environmental dynamism in 2017 to evaluate the impact of this dynamism. First, we compiled the financial data of listed firms from the CSMAR database to calculate industry sales at the Chinese two-digit industry level from 2012 to 2017. We then regressed the natural logarithm of industry sales in 2017 on an index variable of five prior consecutive years (i.e., 2012–2016). In addition, we operationalized the antilog of the standard error of the regression slope coefficient to capture environmental dynamism for the year 2017 (Keats & Hitt, 1988). We then used the mean values of environmental dynamism in 2017 and 2018 to check the robustness of the findings. The results of the two measures were consistent.

Control variables. To reduce the potential endogeneity caused by the omitted variables, we controlled for 10 variables that can affect BMI. At the CEO and TMT levels, we controlled for CEO gender, CEO age, CEO education, TMT gender heterogeneity, TMT age heterogeneity, and TMT education heterogeneity. Prior studies have suggested demographic characteristics (i.e., gender, age, and education) can affect organizational outcomes (Hambrick & Mason, 1984), and the heterogeneity of these characteristics can affect firms' ability to manage strategic change outcomes (Naranjo-Gil et al., 2008), all of which can affect BMI. As such, we calculated TMT education heterogeneity and TMT gender heterogeneity using the Blau (1977) index. Following Allison (1978), we calculated TMT age heterogeneity by the ratio of each TMT's standard deviation of age to TMT members' mean age. CEO-TMT exchange quality differentiation within TMT was also controlled because high CEO-TMT

exchange differentiation can create tension in a team and thereby influence the integration of its members (Lin & Lin, 2019); this, in turn, can negatively shape BMI. We then measured CEO-TMT exchange quality differentiation using within-team variance across TMT members on their respective CEO-TMT exchange quality scores (Lin & Lin, 2019). At the firm level, we controlled for firm age, measured as the years since a firm's founding, and firm size, measured as the logarithm of the number of employees. We also controlled for past financial performance, measured as the return on assets, because managers can modify business models if their firm's prior performance did not meet expectations (Lages et al., 2008).

5 | RESULTS

5.1 | Measure validation

We used a confirmatory factor analysis (CFA) to validate the reliability and validity of the measurement. The CFA results, including all survey constructs, showed good fit indices ($\chi^2/df = 459.886/101 = 4.553$, root mean squared error of approximation [RMSEA] = 0.076, standardized root mean squared residual [SRMR] = 0.036, Tucker-Lewis index [TLI] = 0.947, and comparative fit index [CFI] = 0.956). As shown in supplementary Appendix 3, the values of Cronbach's α and composite reliability were all above 0.700, revealing good reliability (Hair et al., 2010). Considering we measured TMT-perceived CEO-TMT exchange quality using three TMT members' responses, we adapted an agreement index (r_{wg}) to justify the aggregation of their responses (James et al., 1984). The median value of r_{wg} values for TMT-perceived CEO-TMT exchange quality was 0.982, well above the 0.700 benchmark, thereby supporting aggregation (Chan, 1998). Additionally, we examined intraclass correlations (ICC; Bliese, 2000): ICC(1) indicated the degree of agreement among member responses in the same group, and its desired values were above 0.200 (Bliese, 2000); ICC(2) represented the extent to which groups can be differentiated according to the variable of interest (Bliese, 2000), and its desired values were above 0.600 (Glick, 1985). The results show that both ICC(1) and ICC(2) were above the acceptable thresholds, indicating good inter-rater reliability of TMT-perceived CEO-TMT exchange quality (ICC(1) = 0.586, ICC(2) = 0.809).

We further assessed the measurement's convergent and discriminant validity. The results show that the standardized factor loadings ranged from 0.649 to 0.942, which were above the cutoff value of 0.50 (Hair et al., 2010). Meanwhile, the average variance extracted

(AVE) values ranged from 0.669 to 0.822, well above the cutoff value of 0.500 (Hair et al., 2010). These results indicated good convergent validity. As shown in Table 2, the square roots of the AVE value of each construct were all greater than the correlations between constructs, indicating strong discriminant validity.

Table 2 shows the correlations of CEO-perceived CEO-TMT exchange quality with TMT-perceived CEO-TMT exchange quality and BMI were above 0.600. Although these correlations were significantly below the cutoff value of 0.800 (Bagozzi et al., 1991), we examined the variance inflation factors (VIFs) and condition indices to test the potential threat of multicollinearity. The results indicated that the VIFs ranged from 1.020 to 2.281, well below the cutoff value 4.000 (Glantz & Slinker, 2001). The condition indices of all models were below the recommended values of 30.000 (Cohen et al., 2003). These findings suggest that multicollinearity was not a significant issue in this study.

5.2 | Common method bias

We conducted procedural remedies and statistical tests to address the potential of common method bias using four procedural remedies for mitigating common method bias (Podsakoff et al., 2003). First, we promised respondents that the collected answers were for academic research only. Second, we kept the questions concise and straightforward to reduce item ambiguity. Third, we separated the items related to independent and dependent variables into different pages of the questionnaire. Finally, we combined the archival and survey data of the CEO and three members of each firm to test the research model.

In addition, we conducted statistical tests to check common method bias. First, we compared the fit between the measurement and one-factor models. The fit indices of the one-factor model ($\chi^2/df = 2376.780/104 = 22.854$, RMSEA = 0.188, SRMR = 0.112, TLI = 0.676, CFI = 0.719) were significantly worse than those of the measurement model. Second, we used a marker variable to test for common method bias (Lindell & Whitney, 2001); we selected a single-item construct (i.e., firms' attention to news media) as a marker variable, reflecting the degree of recognition for news media, ranging from 1 to 5; we then selected the second smallest positive correlation ($r = 0.008$) between the marker variable and other variables to adjust correlations and calculate the t -values of the adjusted correlations (Lindell & Whitney, 2001). None of the significant correlations among the main constructs became nonsignificant, and the magnitude of the correlation had no noticeable change after including the marker variable. Third, we employed the CFA latent marker technique, further

testing the common method bias (Williams et al., 2010) using the CEO causality thinking tendency as a marker variable because it is theoretically unrelated to the constructs in our research model. Causality thinking tendency is defined as an opinion on how to explain a causal relationship (Choi et al., 2007). We invited the CEOs to respond to four measurement items from Choi et al. (2007), and the results also showed that common method bias was not a serious problem (see supplementary Appendix 4). Moreover, common method bias was unlikely to exist with significant interaction terms (Podsakoff et al., 2012) because it is difficult for respondents to anticipate an interaction term produced by a survey-based measure (i.e., CEO-TMT exchange quality) and an archival data-based measure (i.e., environmental dynamism). The existence of significant interactions in the polynomial regression results (see Table 3) thus indicated minimal common method bias. In sum, common method bias was not a serious issue in our study.

5.3 | Hypothesis testing

We employed a polynomial regression with a response surface analysis to test our hypotheses because this method can analyze the effect of incongruence between two predictor variables on an outcome of interest (Edwards & Parry, 1993). Polynomial regression provides more precise and robust predictions of outcomes at each combination of two predictor variables (Edwards, 2002). Additionally, the response surface analysis allowed us to efficiently and comprehensively interpret the polynomial regression results and evaluate the effect of (in)congruence between the two predictor variables through a three-dimensional graph (Edwards & Parry, 1993).

We first estimated the individual effects of CEO-perceived CEO-TMT exchange quality (CCTX) and TMT-perceived CEO-TMT exchange quality (TCTX) on BMI. Then, to test Hypothesis 1, we constructed a model to estimate BMI as a function of CCTX, TCTX, and the high-order terms that denote their interplay (i.e., CCTX², CCTX × TCTX, and TCTX²; Edwards, 2002; Edwards & Parry, 1993). To reduce the potential multicollinearity of product terms, we used mean-centered CCTX and TCTX to calculate the high-order terms. The complete polynomial equation is as follows:

$$\text{BMI} = \beta_0 + \beta_1 \text{CCTX} + \beta_2 \text{TCTX} + \beta_3 \text{CCTX}^2 + \beta_4 \text{CCTX} \times \text{TCTX} + \beta_5 \text{TCTX}^2 + \text{Controls} + \varepsilon. \quad (1)$$

When any of the high-order terms in Equation (1) were significant, we used the response surface to reflect

TABLE 2 Correlation matrix, reliability, validity, and descriptive statistics.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1. Business model innovation	0.818	0.644***	0.553	-0.010	0.005	-0.009	0.069†	-0.001	-0.068	-0.063	0.142***	0.033	0.005	-0.073	0.335***
2. CEO-TMT exchange quality (CEO-perceived)	0.647***	0.840	0.68***	0.019	-0.009	-0.018	-0.005	0.000	-0.031	0.001	0.050	0.018	0.039	-0.076	0.215***
3. CEO-TMT exchange quality (TMT-perceived)	0.557***	0.679***	0.907	-0.009	0.007	-0.008	0.039	-0.094**	-0.014	-0.051	0.042	0.017	0.023	-0.024	0.252***
4. Environmental dynamism	-0.002	0.027	-0.001	n.a.	0.008	-0.004	-0.104**	-0.050	0.037	0.001	-0.126**	0.011	-0.044	-0.003	0.007
5. Past firm performance	0.013	-0.001	0.015	0.016	n.a.	-0.051	-0.018	-0.030	-0.044	-0.060	-0.027	0.030	-0.045	-0.011	-0.064
6. Firm age	-0.001	-0.010	0.000	0.004	-0.043	n.a.	0.201	-0.046	-0.014	0.250***	-0.007	-0.039	-0.006	-0.005	0.000
7. Firm size	0.077*	0.004	0.047	-0.096**	-0.010	0.207***	n.a.	-0.044	-0.057	0.078	0.177***	-0.149***	0.010	-0.052	0.022
8. CEO-TMT exchange quality differentiation	0.007	0.008	-0.086**	-0.041	-0.022	-0.038	-0.036	n.a.	-0.027	-0.031	0.022	-0.024	-0.044	0.024	0.062
9. CEO gender	-0.059	-0.022	-0.006	0.045	-0.036	-0.006	-0.049	-0.019	n.a.	-0.022	-0.117**	0.026	0.015	0.037	0.018
10. CEO education	-0.054	0.009	-0.043	0.009	-0.052	0.256	0.085**	-0.023	-0.014	n.a.	-0.157***	-0.080*	-0.026	0.016	-0.062
11. CEO age	0.149***	0.058	0.050	-0.117***	-0.019	0.001	0.184***	0.030	-0.108***	-0.148***	n.a.	0.024	-0.108	-0.114**	0.105**
12. TMT gender heterogeneity	0.041	0.026	0.025	0.019	0.038	-0.030	-0.140***	-0.016	0.034	-0.072	0.032	n.a.	0.019	0.092	0.035
13. TMT education heterogeneity	0.013	0.047	0.031	-0.035	-0.037	0.002	0.018	-0.036	0.022	-0.018	-0.099***	0.027	n.a.	0.067	0.042
14. TMT age heterogeneity	-0.065	-0.068***	-0.016	0.005	-0.003	0.003	-0.043	0.032	0.045	0.024	-0.105***	0.100	0.074*	n.a.	0.000
15. Marker (attention to news media)	0.340***	0.221***	0.258***	0.015	-0.055	0.008	0.029	0.070	0.026	-0.054	0.113	0.043	0.049	0.004	n.a.
Mean	4.201	4.390	4.282	10.221	0.117	12.272	4.971	0.072	n.a.	3.083	0.178	49.611	0.203	0.136	3.174
Standard deviation	0.525	0.465	0.434	0.136	0.118	5.800	0.880	0.131	n.a.	0.684	0.218	8.246	0.227	0.093	0.970

Note: The diagonal elements are the square roots of AVEs. Zero-ordered correlations are below the diagonal; adjusted correlations for the potential common method bias are above the diagonal.

Abbreviations: AVE, average variance extracted; n.a., not applicable; TMT, top management team.

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 3 Polynomial regression results.

	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
CEO-perceived CEO-TMT exchange quality (CCTX)		0.561***	0.562***	0.557***	0.557***	0.572***
TMT-perceived CEO-TMT exchange quality (TCTX)		0.257***	0.254***	0.224***	0.224***	0.206***
CCTX ²				-0.189†	-0.189†	-0.246*
CCTX × TCTX				0.552***	0.552***	0.606***
TCTX ²				0.006	0.006	0.007
Environmental dynamism (ED)			-0.543		0.007	0.737**
ED × CCTX						0.119
ED × TCTX						0.139
ED × CCTX ²						-2.668**
ED × CCTX × TCTX						0.712
ED × TCTX ²						-1.09†
Past firm performance	0.051	0.037	0.037	0.003	0.003	0.002
Firm age	-0.000	0.000	0.000	-0.001	-0.001	-0.001
Firm size	0.036	0.032†	0.032†	0.035†	0.035†	0.038*
CEO-TMT exchange quality differentiation	0.028	0.080	0.050	0.199	0.199	0.174
CEO gender	-0.090	-0.073	-0.063	-0.099	-0.099	-0.085
CEO education	0.095**	0.067**	0.064**	0.072**	0.072**	0.073**
CEO age	-0.002	-0.003	-0.003	-0.003†	-0.003†	-0.003+
TMT gender heterogeneity	0.117	0.068	0.068	0.073	0.073	0.073
TMT education heterogeneity	0.065	-0.017	-0.024	-0.019	-0.019	-0.033
TMT age heterogeneity	-0.301	-0.092	-0.080	-0.052	-0.052	-0.000
Constant	3.938***	4.029***	4.029***	4.037***	4.037***	4.009**
F-statistic						2.380*
R ²	0.033	0.463	0.465	0.489	0.489	0.501
Adjusted R ²	0.017	0.452	0.453	0.476	0.476	0.483

Note: F-statistic is based on the change in variance explained compared with the main polynomial regression model excluding environmental dynamism and its interaction terms.

Abbreviations: CCTX, CEO-perceived CEO-TMT exchange quality; TCTX, TMT-perceived CEO-TMT exchange quality; TMT, top management team.

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

the effects of the incongruence between CCTX and TCTX on BMI (Edwards & Parry, 1993). We plotted the response surfaces based on the polynomial regression results. The horizontal axes represented CCTX and TCTX, whereas the vertical axis represented BMI (Edwards, 2002). For surface shape along the congruence line (i.e., CCTX = TCTX) and the incongruence line (i.e., CCTX = -TCTX), we calculated slope and curvature using the estimated coefficients for polynomial terms. Specifically, we calculated the slope of the surface along the congruence line as $\beta_1 + \beta_2$; the curvature of the surface along the congruence line as $\beta_3 + \beta_4 + \beta_5$; the slope of the surface along the incongruence line as $\beta_1 - \beta_2$, indicating directional discrepancy between CCTX and TCTX; and the curvature of the surface along the incongruence line as

$\beta_3 - \beta_4 + \beta_5$ and revealed the degree of discrepancy between CCTX and TCTX.

In Hypothesis 1, we proposed CEO-TMT exchange quality incongruence would be detrimental to BMI. This hypothesis will be deemed supported if the curvature of the surface along the incongruence line is significant and negative (Edwards & Parry, 1993). As presented in Table 3 and Figure 3, the results showed a negative and significant curvature (curvature [$\beta_3 - \beta_4 + \beta_5$] = -0.736, CI [-1.459 to -0.129]) of the surface along the incongruence line, indicating CEO-TMT exchange quality incongruence had a significantly negative effect on BMI. Thus, Hypothesis 1 is supported.

We followed Vogel et al. (2016) in testing the moderating role of environmental dynamism (i.e., Hypothesis 2) and controlled for the direct effect of environmental

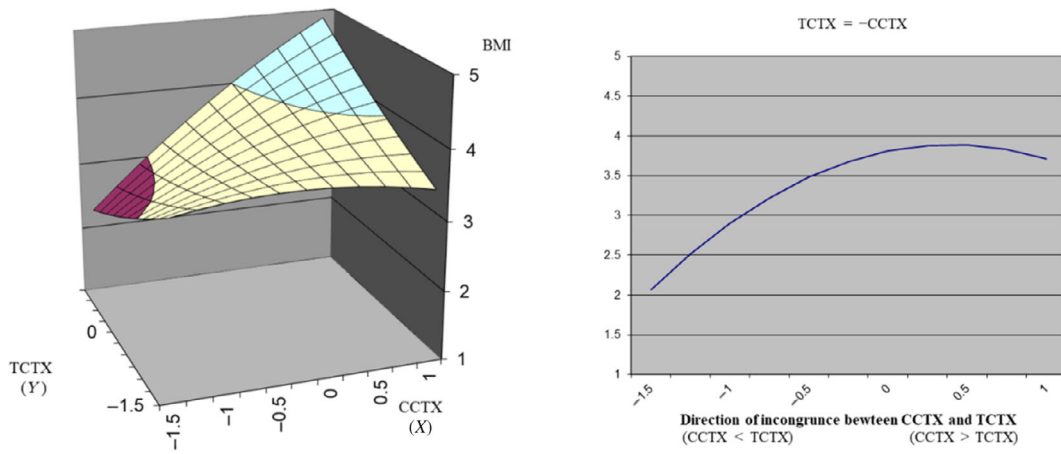


FIGURE 3 Response surface (main effects). BMI, business model innovation; CCTX, CEO-perceived CEO–TMT exchange quality; TCTX, TMT-perceived CEO–TMT exchange quality; TMT, top management team.

dynamism (ED) before estimating the moderating effect (i.e., Equation 2). We then added the five terms (i.e., $CCTX \times ED$, $TCTX \times ED$, $CCTX^2 \times ED$, $CCTX \times TCTX \times ED$, $TCTX^2 \times ED$), which collectively represented the interaction effect of CEO–TMT exchange quality incongruence and ED (i.e., Equation 3). To reduce potential multicollinearity, we used a mean-centered ED to calculate the high-order terms. The significant F -statistic of Equation (3), compared with Equation (2), indicated ED had a significant moderating effect on the relationship between CEO–TMT exchange quality incongruence and BMI. We evaluated the slope and curvature of the surface at high and low levels of environmental dynamism by substituting values one standard deviation above and below the mean of the environmental dynamism (Vogel et al., 2016). Table 3 presents the results of the polynomial regression of the main and moderating effect as follows:

$$\begin{aligned}
 BMI = & \beta_0 + \beta_1 CCTX + \beta_2 TCTX + \beta_3 CCTX^2 + \beta_4 CCTX \\
 & \times TCTX + \beta_5 TCTX^2 + \beta_6 ED + \text{Controls} + \varepsilon,
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 BMI = & \beta_0 + \beta_1 CCTX + \beta_2 TCTX + \beta_3 CCTX^2 \\
 & + \beta_4 CCTX \times TCTX + \beta_5 TCTX^2 + \beta_6 ED \\
 & + \beta_7 CCTX \times ED + \beta_8 TCTX \times ED + \beta_9 CCTX^2 \\
 & \times ED + \beta_{10} CCTX \times TCTX \times ED + \beta_{11} TCTX^2 \\
 & \times ED + \text{Controls} + \varepsilon.
 \end{aligned}
 \tag{3}$$

In Hypothesis 2, we suggested environmental dynamism would strengthen the effect of CEO–TMT exchange

quality incongruence on BMI. The moderating effect of environmental dynamism indicated the shape of the surface along the incongruence line was different at high versus low environmental dynamism. The significant F -statistic ($F = 2.380$, $p < 0.05$) of Model 5 compared with Model 3 in Table 3 suggests environmental dynamism exerted moderating effect on the relationship between CEO–TMT exchange quality incongruence and BMI. When environmental dynamism was low, the curvature of the surface along the incongruence line did not significantly differ from 0 (curvature $[\beta_3 - \beta_4 + \beta_5] = -0.238$, CI $[-1.033$ to $0.488]$), indicating CEO–TMT exchange quality incongruence was not significantly related to BMI. When environmental dynamism was high, the curvature was significant and negative (curvature $[\beta_3 - \beta_4 + \beta_5] = -1.451$, CI $[-2.476$ to $-0.674]$), indicating BMI decreased as CCTX and TCTX diverged. As such, Hypothesis 2 is supported. Figure 4 shows the response surfaces for BMI when environmental dynamism was low and high. The difference between them further confirms our hypothesis.

5.4 | Robustness checks

Although we could alleviate potential endogeneity from omitted variables by including 10 control variables in the regression model, the endogeneity induced by self-selection bias may have also affected the results. The systematic evaluations of their exchange quality may have affected CEOs' decisions to promote managers to TMT members. CEOs may thus generally perceive high exchange quality with their TMT members, which biases the self-selection of TMT members. We used Heckman's (1979) two-stage model to address this bias.

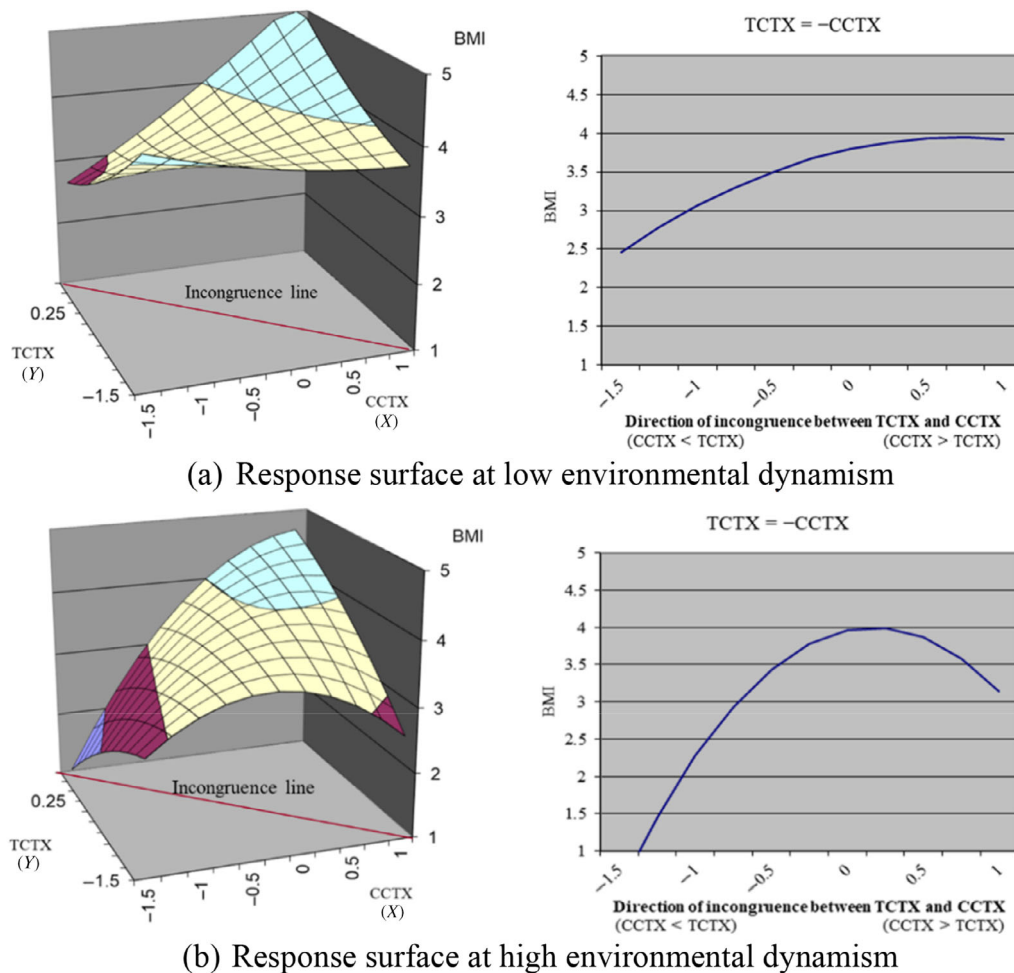


FIGURE 4 Response surface under different levels of environmental dynamism. BMI, business model innovation; CCTX, CEO-perceived CEO–TMT exchange quality; TCTX, TMT-perceived CEO–TMT exchange quality; TMT, top management team.

In the first stage, we constructed a probit model to stimulate a selection equation, and we calculated the inverse Mills ratio (IMR) and then included it in the second-step equation as an additional predictor. We defined a new binary variable (labeled “HCTX”), coded as 1 for firms that scored above average on CCTX and 0 otherwise. We then used the following equation to yield the IMR entered into the primary model (see supplementary Appendix 5 for the results of the first stage of the Heckman model):

$$\text{Probit}(\text{HCTX} = 1) = \Phi(\beta_0 + \beta_r W + u),$$

where W represents the vector of variables in the first step, including control variables and environmental dynamism; Φ represents the cumulative standard normal distribution function; and u represents the error term.

In the second stage, we conducted a response surface analysis after controlling for IMR. The results were

consistent with the main analysis after addressing endogeneity using Heckman’s two-stage model (see supplementary Appendix 6), which further supports our findings.

Additionally, we employed a subsample analysis to check the robustness of the moderating effect. Based on the mean value of environmental dynamism, we separated the sample into two groups with either a high or low level of environmental dynamism. We estimated the polynomial regression and response surface analysis using two sample groups separately, the results of which further confirm H2 (see supplementary Appendix 7). In addition, despite collecting survey data at the beginning of 2018, we also implemented an alternative operationalization of environmental dynamism (i.e., the mean of environment dynamism in 2017 and 2018) to test the moderating effect. The results were consistent with the main analysis (see supplementary Appendix 8). In sum, the analyses support the robustness of our findings.

5.5 | Post hoc analysis

We conducted two post hoc analyses to provide a fine-grained understanding of the influence of CEOs' and TMT members' perceptions of exchange quality on BMI. First, CEOs and TMT members hold different structural positions and therefore possess different key resources for successful exchange to achieve BMI (Sariol & Abebe, 2017; Sparrowe & Liden, 2005). The condition of CEOs perceiving lower or higher CEO–TMT exchange quality than TMT members may have different effects on BMI. Thus, we further compared the influence of two forms of CEO–TMT exchange quality incongruence on BMI to obtain nuanced insight. The significant and positive slope (slope $[\beta_1 - \beta_2] = 0.332$, CI [0.154–0.507]) of the surface along the incongruence line indicated the degree of BMI was higher when CEOs perceived higher CEO–TMT exchange quality than TMT members compared with when TMT members perceived higher CEO–TMT exchange quality than CEOs. Figure 3 also shows the right corner (CCTX > TCTX) was higher than the left corner (TCTX > CCTX). These results indicate that BMI would be lower when CEOs perceived a lower rather than higher CEO–TMT exchange quality than TMT members.

Second, it is possible the level of CEO–TMT exchange quality at which CEOs' and TMT members' perceptions are congruent may offer additional predictive power in explaining BMI variations. In other words, it may be necessary to understand how the absolute level of CEO–TMT exchange quality can affect BMI when CEOs and TMT members have similar perceptions of exchange quality. We thus further examined the effects of various levels of CEO–TMT exchange quality congruence on BMI using the polynomial regression and response surface analysis. We conducted this analysis via response

surface along the congruence line (i.e., CCTX = TCTX). As shown in Table 4, the slope along the congruence line was positive and significant (slope $[\beta_1 + \beta_2] = 0.781$, CI [0.727–0.845]). The left part of Figure 3 also shows that the back corner (congruence at high levels) was higher than the front (congruence at low levels). These results indicated the degree of BMI was higher when CEOs' and TMT members' perceptions of exchange quality were congruent at high levels as opposed to low levels.

6 | DISCUSSION AND CONCLUSION

In the current study, we treated CEO–TMT exchange quality incongruence as a substantive construct and utilized a polynomial regression and response surface analysis to comprehensively analyze various BMI conditions when CEOs' and TMT members' perceptions of CEO–TMT exchange quality are incongruent. Our empirical analyses provide significant findings that expand the existing literature on BMI and CEO–TMT exchange quality. First, consistent with our hypotheses, the results suggest CEO–TMT exchange quality incongruence had a significantly negative effect on BMI. This finding reveals that although high CEO- and TMT-perceived exchange quality positively and individually affected BMI, high CEO–TMT exchange quality was most beneficial when both CEOs and TMT members perceived exchange quality congruently. In the face of incongruence, a high CEO–TMT exchange quality from either party's perspective did little to support BMI. Second, the findings show environmental dynamism aggravated the negative effect of CEO–TMT exchange quality incongruence on BMI. We found environmental dynamism to be a significant boundary condition regarding the influence

TABLE 4 Response surfaces analysis for main and moderation effects.

	Main effect	Environmental dynamism	
		Low	High
Congruence line			
Slope ($\beta_1 + \beta_2$)	0.781	0.743	0.813
95% CI	[0.727 to 0.845]	[0.664 to 0.839]	[0.729 to 0.915]
Curvature ($\beta_3 + \beta_4 + \beta_5$)	0.369	0.780	−0.05
95% CI	[0.194 to 0.512]	[0.495 to 0.996]	[−0.336 to 0.185]
Incongruence line			
Slope ($\beta_1 - \beta_2$)	0.332	0.368	0.363
95% CI	[0.154 to 0.507]	[0.146 to 0.565]	[0.131 to 0.614]
Curvature ($\beta_3 - \beta_4 + \beta_5$)	−0.736	−0.238	−1.451
95% CI	[−1.459 to −0.129]	[−1.033 to 0.488]	[−2.476 to −0.674]

Note: 95% confidence intervals (CI) were produced from 10,000 bootstrapped estimates.

of CEOs and TMT members on firm outcomes (Mammassis & Kostopoulos, 2019; Richard et al., 2019).

The post hoc analysis also provided interesting insights. First, the results further illustrate the combination of low CEO-perceived exchange quality and high TMT-perceived exchange quality was more detrimental to BMI than the combination of high CEO-perceived exchange quality and low TMT-perceived exchange quality. This signifies that CEO-perceived exchange quality had a more significant influence on BMI than TMT-perceived exchange quality, evidencing the relative significance of CEOs in BMI (Colovic, 2021; Snihur & Zott, 2020). Second, BMI was higher when CEOs and TMT members perceived similarly high (rather than low) CEO–TMT exchange quality. This may be because when both CEOs and TMT members perceive high exchange quality, they are in consensus regarding their socio-emotional relationship. In such cases, CEOs and TMT members feel safe revealing their entrepreneurial desires and concerns about existing business models and are willing to provide the resources necessary to support one another in the pursuit of BMI (Doz & Kosonen, 2010). In contrast, when CEOs and TMT members perceive low exchange quality, they instead reach a consensus whereby they believe the nature of their exchange relationship is transactional (Matta et al., 2015). When this happens, CEOs and TMT members tend to perform only according to their contractual obligations (Cogliser et al., 2009; Matta et al., 2015). They may, as a result, rarely exchange creative insights to improve BMI (Lin & Rababah, 2014). This finding aligns with that of other scholars, who have found mutually congruent high exchange quality perceptions among leaders and members can generate optimal individual-level performance, such as in work engagement (Matta et al., 2015) and employee performance (Cogliser et al., 2009).

6.1 | Theoretical implications

This study contributes to the existing scholarship in three notable ways. First, it enriches the literature on antecedents of BMI from the upper-echelon perspective (Foss & Saebi, 2017; Narayan et al., 2021) by investigating the relationship between CEO–TMT exchange quality incongruence and BMI. Given the importance of BMI for firm performance (Schrauder et al., 2018), it is critical to determine its antecedents. Recent upper echelons literature has noticed that the CEO–TMT interface may shape CEOs' and TMT members' decision-making and their cooperative behaviors, thus affecting strategic activities such as BMI (Georgakakis et al., 2022; Simsek

et al., 2018). However, existing studies have primarily focused on how either CEOs' characteristics (e.g., Snihur & Zott, 2020) or collective attributes of both CEOs and TMT members (e.g., Guo et al., 2017; Narayan et al., 2021) affect BMI, leaving the influence of the CEO–TMT interface on BMI underexplored. This study addresses the escalating need to delve into the influence of the CEO–TMT interface on BMI by examining the relationship between CEO–TMT exchange quality incongruence (i.e., as a manifestation of the CEO–TMT interface) and BMI. By doing so, this study enhances our understanding of the importance of upper echelons for BMI.

Second, this study advances the stream of research on CEO–TMT exchange quality by proposing CEO–TMT exchange quality incongruence and examining its influence on strategic outcomes. Prior studies on CEO–TMT exchange quality have assumed CEOs and TMT members hold similar perceptions of exchange quality, and their examinations have been largely limited to the TMT perspective (Lin & Lin, 2019; Lin & Rababah, 2014). This assumption, however, does not account for the frequency of variation among CEOs and TMT members regarding the exchange quality of their relationships (Sin et al., 2009). Given CEOs and TMT members are both key influencers of BMI (Doz & Kosonen, 2010), incongruent perceptions among them can greatly complicate the influence of CEO–TMT exchange quality on BMI. Our research follows LMX theory to incorporate the dyadic view of CEOs and TMT members (Krasikova & Lebreton, 2012; Sin et al., 2009), thus expanding the understanding of the inherent complexities within the CEO–TMT exchange relationship. Specifically, our findings show that although high CEO- and TMT-perceived exchange quality can enhance BMI independently, CEO–TMT exchange quality incongruence (i.e., CEOs perceiving higher or lower exchange quality than TMT members) will hinder BMI. These key findings indicate that it is unreasonable to generalize a simple positive effect of CEO–TMT exchange quality without considering both CEOs' and TMT members' sides. By introducing CEOs' and TMT members' dyadic views on their exchange quality, this study reveals the negative effect of CEO–TMT exchange incongruence on BMI and sheds light on the cost of ineffective CEO–TMT exchange (Lin & Lin, 2019).

Third, this study explores the moderating role of environmental dynamism in the relationship between the CEO–TMT interface and BMI. On the one hand, it responds to calls to consider environmental dynamism in studying the outcomes of the CEO–TMT interface (Georgakakis et al., 2022; Simsek et al., 2018). On the other hand, it complements studies that have linked environmental dynamism with BMI. Such studies have either

investigated the role of environmental dynamism in shaping BMI or its influence on firm outcomes (Pati et al., 2018; Yuan et al., 2021). Some studies have found the positive effect of environmental dynamism for firms pursuing BMI (Yuan et al., 2021). For example, Zhang and Zhu (2022) suggested that environmental dynamism could enhance the positive effect of social media's strategic capability on BMI. Our findings alternately indicate high environmental dynamism can aggravate the negative impact of CEO–TMT exchange quality incongruence on BMI, which productively expands existing knowledge on the positive aspects of environmental dynamism for achieving BMI. As such, this research further reveals how environmental dynamism can be a double-edged sword for BMI.

6.2 | Managerial implications

This study also has important managerial implications. First, given that our results indicate CEO–TMT exchange quality incongruence negatively affects BMI, CEOs and TMT members should pursue high and similar exchange quality when attempting to innovate a firm's business models. For example, CEOs might consider adjusting their affective expressions or changing the TMT composition to build socio-emotional relationships with TMT members and achieve high CEO–TMT exchange quality. Moreover, to avoid incongruent perceptions, CEOs should encourage TMT members to communicate perceived disparities in exchange quality and work with them to resolve said disparities. It may be easier for CEOs to increase TMT members' perceptions of CEO–TMT exchange quality because CEOs have higher positional power than TMT members. Given that CEOs' low perceptions of CEO–TMT exchange quality are more detrimental to BMI, CEOs should display trust in and care for TMT members and send positive signals to enhance their exchange relationships with TMT members, which can help cultivate a sense of psychological safety in the joint exploration of novel business models. This will allow CEOs and TMT members to discuss imperfections in existing business models more openly and honestly and accordingly propose innovative insights.

Second, when firms intend to innovate their business models, both CEOs and TMT members should be cognizant of the influence of environmental dynamism. Because dynamic environments can amplify the negative effect of CEO–TMT exchange incongruence on BMI, CEOs and TMT members should prioritize the achievement of congruent and high CEO–TMT exchange quality to better support BMI. In dynamic environments, CEOs and TMT members should intentionally and frequently

review each party's perceptions of their exchange quality. Moreover, CEOs and TMT members should provide timely and useful information to one another to effectively relieve uncertainty. Doing so can help both parties reach a high, congruent exchange quality for jointly coping with the challenges of volatile environments. Importantly, CEOs and TMT members should not rush into solving perceptual incongruence in exchange quality when innovating business models in stable environments.

6.3 | Limitations and directions for future research

In addition to its contributions, this study has limitations that could be addressed by future researchers. First, our cross-sectional research design cannot establish causality. Future researchers might thus collect longitudinal data to further examine how the dynamics of CEO–TMT exchange quality influence BMI. Second, it is difficult to collect data from all TMT members to operationalize TMT-perceived CEO–TMT exchange quality. Although we collected data from three important positions among TMT members that play significant roles in business model-related activities (i.e., marketing, operations, and administration), other senior managers (e.g., IT managers) may also influence BMI. Future researchers should thus collect data from all TMT members to assess CEO–TMT exchange quality as accurately as possible. Third, consistent with the existing literature (Lin & Lin, 2019; Lin & Rababah, 2014), we measured TMT-perceived CEO–TMT exchange quality with the mean score of each top manager's assessment of CEO–TMT exchange quality. However, TMT members may perceive varied levels of exchange quality with CEOs. Fourth, we identified the high correlation between CEO- and TMT-perceived exchange quality. Although we employed several methods to mitigate the multicollinearity issue, we cannot completely eliminate its potential threats. Thus, we encourage future research to reexamine this study to further validate our results. Furthermore, although we took CEO–TMT differentiation as a control variable, future researchers might take a closer look at how CEO–TMT exchange quality differentiation within teams influences BMI.

6.4 | Conclusion

In this study, we investigate how CEO–TMT exchange quality incongruence affects BMI and reveal the relative effects of two forms of CEO–TMT exchange quality

incongruence. Our results indicate CEO–TMT exchange quality incongruence negatively affects BMI. We also found highly dynamic environments can aggravate the negative effect of CEO–TMT exchange quality incongruence on BMI. Together, these findings expand the existing insights on BMI and the CEO–TMT exchange quality literature and present important managerial implications for firms pursuing BMI.

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SUPPORTING INFORMATION

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

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