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FROM ATTENTION TO ACTION:
THE INFLUENCE OF COGNITIVE AND IDEOLOGICAL DIVERSITY IN TOP MANAGEMENT TEAMS ON BUSINESS MODEL INNOVATION

ABSTRACT

As top management teams (TMTs) become progressively more diverse, an important question arises: how does greater TMT diversity affect a company's ability to innovate its business model? To examine this, we draw on the upper-echelons literature and on research on business models as activity systems to theorize that cognitive and ideological diversity in TMTs will affect teams' attention to business model innovation (BMI) and companies' BMI intensity. Analysis of longitudinal data from firms in the U.S. printing and publishing industry provides support for the theory that, over time, TMT cognitive and ideological diversity have a positive influence on BMI. Whereas cognitive diversity expands TMT's BMI attention-scope, both cognitive and ideological diversity increase BMI intensity. However, too much ideological diversity has a negative effect. We furthermore find that TMT longevity moderates the effects of TMT diversity positively, suggesting that the benefit of diversity grows as team members work together longer as a team. We discuss the study's contributions to the literature on diversity, BMI, and the upper echelons.

Keywords: Executive Leaders, Values, Conservatism-Liberalism, Team Longevity, Business Models

INTRODUCTION

In the developed regions of the world, economic, socio-political and technological forces are producing ever more diverse societies. As a result, specialized knowledge and skills no longer constitute the only salient difference between those making up today's workforce. Employees also now differ significantly in their identities and mindsets shaped by age, culture, ethnicity, faith, gender, life-styles, and sexual orientation. As heterogeneity increases, calls are growing for greater representation of this diversity in the upper echelons of corporate management. This makes it important to study whether diversity in top management teams (TMTs) is likely to have consequences, one way or the other, for firms' ability to deal with the demands of today's business environment. Against this backdrop, the present article explores the effect of TMT diversity on business model innovation (BMI), a crucial contemporary challenge for firms seeking to create competitive advantage by replacing dated business models with newer ones (see also, Loon et al., 2020). Building on Hambrick and Mason's (1984) upper-echelons framework and the TMT literature that has followed (e.g., Boone et al., 2019; Hambrick et al., 2015; Schubert and Tavassoli, 2020; Wei and Wu, 2013), the article examines how TMTs' cognitive and ideological diversity influence TMTs' attention to BMI and companies' BMI intensity.

The business model concept refers to the content, structure, and governance of a company's value creating and capturing transactions with its environment (Amit and Zott, 2001; Snihur et al., 2018). The literature on the topic maintains that innovating a firm's business model is quite different from product, process and organizational innovation, and that architectural interdependencies among content, structure, and governance elements make it rather difficult to alter a business model to accommodate changes generated by the evolution of technologies, customer needs and competitive dynamics (Chesbrough, 2010; Foss and Saebi, 2017). There is,

thus, great interest in developing understanding of the factors that foster BMI and especially in studying the influence a firm's TMT has on BMI (Bock et al., 2012; Cozzolino et al., 2018) by virtue of being the firm's chief decision-making group (Hambrick and Mason, 1984). Speaking to this interest, our study examines specifically how diversity in TMTs influences BMI, a topic that to the best of our knowledge has not yet received explicit scrutiny. In doing so, the study departs from the piecemeal focus of past diversity research by examining how BMI is affected by not only cognitive (or intellectual) diversity but also ideological (liberal – conservative) diversity, an increasingly important factor behind organizational decisions (e.g., Park et al., 2019). Particularly, the study examines how these two principal types of TMT diversity impacted BMI over a crucial ten-year period in the printing and publishing industry.

The examination of cognitive and ideological diversity's effect over time, takes this study beyond cross-sectional studies that have looked at the association between specific facets of demographic diversity and organizational outcomes at a point in time (e.g., Buyl et al., 2011; Qian et al., 2013). Cognitive diversity, also alluded to as diversity of thought, refers to variety in group members' knowledge and intellectual perspectives (Barkema and Shvyrkov, 2007; Østergaard et al., 2011) because of their different life-experiences as members of discrete socio-cognitive categories defined by age, education, functional specialization, gender, and nationality. Ideological diversity, in contrast, captures variety in group members' values in relation to preferable modes of conduct and end-states of existence (Chin et al., 2013; Gupta and Briscoe, 2020). Thus, while differences in knowledge and intellect define cognitive diversity, ideological diversity is defined by differences in emotional disposition vis-à-vis beliefs about right and wrong. In the field of management, people's position on the liberal-conservative spectrum of political beliefs has fast become the standard to identify the ideology or values they espouse with respect to the full range

of social and economic issues, including women's right to abortion, community welfare, maintenance of law and order, and free-market principles (Chin et al., 2013; Gupta et al., 2018).

As argued in more detail later, we contend that TMT cognitive and ideological diversity will have a positive influence on TMT attention to BMI and firm's BMIs over time. We specifically submit that diversity of thought and values will expand TMT's BMI attention-scope, i.e., the ambit of TMT's attention vis-à-vis the content, structure and governance components of a business model. We also submit that by facilitating business-model ideation and implementation, diversity will increase firm's BMI intensity. Results based on panel data from SIC 27 firms on the NYSE from 2003 to 2013 show that TMT cognitive diversity positively affected teams' BMI attention-scope, and that this effect strengthened as TMT longevity (i.e., the period TMT had been together) increased. Unexpectedly, results also show that TMT cognitive diversity had a negative effect on BMI intensity, but that TMT longevity's positive moderation reversed it. Further, TMT ideological diversity had a nonlinear effect on BMI intensity, first increasing with ideological diversity and then decreasing. Here too, TMT longevity attenuated the negative effect. Altogether, the results indicate that cognitive and ideological diversity have somewhat different effects on BMI and that these depend on the time element of how long a TMT has worked together. The study underlines the value of being attentive to different forms of diversity and of adopting a temporal perspective on TMTs when examining diversity's influence in organizations.

The article makes several contributions. By showing that both TMT diversity in thought and TMT diversity in values matter for a key outcome such as BMI, it contributes to the agenda of diversity research in management studies. As the topmost layers of management in companies become more variegated in terms of executives' experiential backgrounds and the worldviews they

espouse (Boone et al., 2019; Gupta et al., 2017), the article highlights the value of paying concurrent attention to different types of diversity for building a better understanding of their exact effects. It indicates that companies, overall, stand to gain from both TMT cognitive and ideological diversity, but that the effects will depend on how long a TMT stays intact. The article also contributes to the literature on business models. By showing that diversity in TMTs influences BMI attention-focus and BMI intensity, it moves the needle on our understanding of the drivers of BMI search and experimentation (Foss and Saebi, 2017, Sosna et al., 2010). The article moreover contributes to the upper-echelons research. Against the backdrop of much interest in how corporate leaders' political ideology affects strategic decisions and outcomes (Chin et al., 2013; Park et al., 2019), the study shows for the first time that ideological diversity in TMTs can be of value in relation to BMI. We discuss these contributions in further detail in the concluding section.

RESEARCH BACKGROUND

TMT Cognitive and Ideological Diversity

Hambrick and Mason's (1984) upper-echelons framework has stimulated much research on the strategy preferences of executives. The framework offers a parsimonious account of how cognition and values form executives' personal, idiosyncratic lens that affects strategic choices through perceptual filtering and behavior channeling (Chin et al., 2013). Because the topmost executives share tasks, responsibilities and power, upper-echelons research has sought to understand how firms' decisions and outcomes are affected by cognitive diversity and values diversity in TMTs (e.g., Boone and Hendriks, 2009; Díaz-Fernández et al., 2019; Heyden et al., 2012; Marcel, 2009). As it is not easy to observe and measure cognitive diversity directly, the variable has usually been studied indirectly, as the unseen mechanism explaining the effects of diversity in executives' more

visible and measurable characteristics (Bromiley and Rau, 2016; Kilduff et al., 2000). To illustrate, the access that cognitive diversity provides to a wider range of information, knowledge and perspectives is suggested routinely as the underlying reason for the effects of heterogeneity in executives' functional expertise (Qian et al., 2013; Sidhu et al., 2020).

Similarly, researchers often ascribe to cognitive diversity the effects of observable TMT heterogeneity along socio-demographic dimensions like age (Finkelstein and Hambrick, 1996; Wiersema and Bantel, 1992), education (Díaz-Fernández et al., 2019; Simons et al., 1999), gender (Opstrup and Villadsen, 2015; Quintana-García and Benavides-Velasco, 2016) and nationality (Boone et al., 2019; Wulf et al., 2020). In line with this and the broader research on human cognition, we conceptualize TMT cognitive diversity as variety in team members' knowledge and intellectual perspectives arising from members' different life-experiences as affiliates of specific categories defined by socio-cognitive variables such as nationality, gender, functional specialism, educational attainment and age cohort (cf. Barkema and Shvyrkov, 2007; Kolev and McNamara, 2020; Østergaard et al., 2011). Differences in category affiliation are said to ingrain dissimilar knowledge structures, understandings and outlooks in people because of exposure to different information sets and meanings. Thus, executives from different nations can expand a team's cognitive diversity because of the unique imprints of their country and culture on their minds (Boone et al., 2018; Nielsen and Nielsen, 2011). Male and female team members, likewise, increase cognitive diversity by bringing mindsets forged by contrasting experiences through life (Hillman et al., 2007; Triana et al., 2013). Similarly, more TMT cognitive diversity is likely when executives have different understandings because of belonging to separate groups formed by age

or generation, educational level and functional area (e.g., Qian et al., 2013; Schubert and Tavassoli, 2020).

TMTs can also differ in terms of the diversity of ideologies or values members espouse about desirable modes of conduct and end-goals. Ideological diversity differs from cognitive diversity, in that, it does not refer to team members' range of knowledge and intellect, but to their emotional disposition regarding human and social affairs that is rooted in a code of beliefs about right and wrong (e.g., Chin et al., 2013, Rokeach, 1973). Thus, team members with comparable knowledge and intellect may very well differ in their values. Value theorists (e.g., Feather, 1979) and political theorists (e.g., Jost, 2006) note that one's core values can be determined by looking at one's political affiliation. In the U.S., the liberal-conservative political continuum, which finds expression in the socio-economic stances and agenda points of the Democratic and Republican political parties, and in these parties' secular versus religious orientation, has gained traction as a fruitful framework to establish the ideology one embraces (Jost, 2006). The framework is especially germane for business research because liberals and conservatives differ markedly in the primacy they attach to free-market principles and their focus on protecting and promoting respectively, the interests of diverse business stakeholders versus primarily the interests of shareholders or owners (Graham et al., 2009; Jost et al., 2003). Studies indicate that executives' political ideologies may range from extremely liberal to extremely conservative (Francia et al., 2003) and that they guide their decisions in relation to a variety of issues (Chin et al., 2013; Gupta et al., 2018).

Business Models and Innovations in Business Models

A business model, in layman's terms, is the way in which a company conducts its business to generate profits within some larger web of economic relationships. More formally, the business-model concept refers to the content, structure and governance of a company's value creating and capturing transactions with its environment (Amit and Zott, 2001; Teece, 2018). Defined in this way, as Zott and Amit (2010) note, the notion of a business model captures both the complex set of activities performed by a firm, and the resources and capabilities it has to perform them – either within the firm or beyond it through cooperation with partners, suppliers or customers. In line with this perspective, Massa et al. (2017) suggest that the notion encapsulates not only the activities a firm chooses to perform, but also how it performs them, who performs them, and when it performs them (see also, Casadesus-Masanell and Ricart, 2010). Furthermore, the view of business model as an activity-system implies the content, structure and governance components to be interconnected in one architecture, with the content component referring to the specific activities performed, the structure component to the linkages among the activities, and the governance component to the allocation of roles and responsibilities for performing the activities (Casadesus-Masanell and Ricart, 2010; Zott and Amit, 2010).

Multiple developments, including scientific and technological advances, globalization, and changing patterns of competition and customer needs have made timely business model innovation (BMI) a pressing issue for companies seeking to defend and improve their market position (Afuah, 2004; Johnson, 2010; McGrath, 2010). Innovations in the business model can range from relatively small changes in individual business model components to complete replacement of a business model with a new one (Bock et al., 2012; Khanagha et al., 2014). Typically, because of diverse interlinkages between business model components, BMI entails complex change involving multiple alterations in architecture, which makes successful innovation difficult (Baden-Fuller and

Morgan, 2010; Foss and Saebi, 2017). Said a bit more elaborately, the multifaceted interdependencies between content, structure and governance elements (Lanzolla and Markides, 2020) make it challenging to orchestrate system-wide change that not only effectively repositions the firm for a better fit with the environment, but also meets the demands and expectations of partners, suppliers, employees and other key stakeholders (cf. Bouchikhi and Kimberly, 2003; Chesbrough, 2010). Understandably, therefore, there is much interest in the factors that enable or disable BMI (Foss and Saebi, 2017; Zott et al., 2011).

Research on BMI process, i.e., how BMI happens[1], holds that the process is affected by structural barriers, such as, existing investments in assets and slack resources, as well as by psychological barriers in the form of inability to understand structural impediments or in the form of dominant logics that prevent new ways of thinking (Chesbrough, 2010; Chesbrough and Rosenbloom, 2002). In fact, as the BMI process is one of experimentation, trial-and-error learning and discovery (see e.g., Frankenberger et al., 2013; McGrath, 2010), the direction and speed of BMI hinges critically on decision-makers' mental make-up, which governs awareness and understanding of the key issues and the range of possibilities to refashion the business model (cf. Chesbrough, 2010; Sosna et al., 2010). Indeed, as case-study based emerging research suggests, executives' thought patterns may affect the scope of search for new business models and thus BMI (Snihur and Zott, 2019). Building on this work on BMI process, we consider next how TMT diversity is likely to affect BMI. Foreshadowing our full argument, we submit that greater TMT

[1] We also conducted four semi-structured interviews with TMT-level executives of two large and two medium-sized publishing companies with a view to complement literature-based understanding with insights and first-hand anecdotal evidence from the field. The interviews, which lasted between 45-60 minutes, were recorded and transcribed. The interviewees were consistent in recognizing and underlining the distinctive nature of BMI as compared to other forms of innovation, the trial-and-error nature of BMI process, and the salience of TMT executives in owning and driving the process in the publishing industry. Our hypotheses regarding TMT diversity's effects are based on the literature and insights from interviews.

diversity is more likely to direct a team's attention to all three architectural components of a business model, viz., content, structure and governance, implying a broader BMI attention-scope to fuel awareness of innovation challenges and opportunities. We also submit that TMT diversity is likely to foster creative ideation that facilitates the pursuit and introduction of changes in the business model, implying more BMIs.

HYPOTHESES

TMT Diversity and BMI Attention-Scope

Attention is a key psychological construct, which captures the mental processes of noticing and interpreting a specific cue or signal, and devoting time and effort to acquiring information and knowledge related to it (Kahneman, 1973; Li et al., 2013). Human attention operates as an information filter that keeps mental load in check through the selective perception of some cues in the environment, while others are ignored (Driver, 2011; Ocasio, 2011). One's attention focus and therefore the cues one notes is said to be a function of one's cognitive and ideological make-up (Hambrick and Mason, 1984; March and Olsen, 1976). It follows that people whose cognitive and ideological make-up differ have different attention foci. When a TMT is characterized by cognitive and ideological diversity, individual executives' attentiveness to different cues should mean a larger set of issues, events, threats and opportunities being brought to the team's collective attention (cf. Curşeu et al., 2007; Narayanan, et al., 2011). And, as TMT cognitive and ideological diversity increase, so too should a TMT's BMI attention-scope. This argument resonates well with past TMT cognitive diversity research. For example, studies indicate that cognitive diversity on account of executives' varied educational and functional backgrounds expands a TMT's capacity to note, interpret and respond to strategic issues and to adapt a firm's course (Sidhu et al., 2020; Wiersema and Bantel, 1992).

In a similar vein, TMT cognitive diversity because of the presence of male as well as female executives should also expand BMI attention-scope. As female leaders are more attuned to social responsibility cues (Bear et al., 2010; Boulouta, 2013), a gender-diverse TMT is more likely than others to be attentive to not only a business model's structure and governance components, but also the content component to ensure that the value-creating activities do not disregard sustainability ideals. Cognitive diversity arising from age and nationality differences will operate similarly. Due to older executives' mental disposition to focus on extant structural recipes and younger executives' openness to explore new content opportunities, an age-diverse team's attention scope should cover both components (cf. Chesbrough 2010; Snihur and Zott, 2019). Likewise, nationality diversity is likely to expand attention scope by directing a content or governance focused team's attention to the structure component. When team members hail from different nations, their intimate understanding of institutions and markets in those countries is likely to increase attentiveness to signals of cost savings and revenue improvements through the refashioning of firm's international value-chain linkages (Boone et al., 2019; Nielsen and Nielsen, 2011). Furthermore, TMT ideological diversity can also be expected to increase attention scope. Research suggests that while conservative members are likely to draw a team's attention to the structure component given the primacy they attach to operational efficiency and how returns are distributed among claimants, liberal executives sensitivity to community issues should direct attention to the content component and how specific activities are performed (Gupta et al., 2017; Kashmiri and Mahajan, 2017).

Tying the above together, we predict that as TMT cognitive and ideological diversity increase, TMT's scope of attention vis-à-vis business-model content, structure and governance components

will broaden as executives share their individual attention foci with other team members. In contrast, if TMT cognitive and ideological diversity decrease, team members' similar attention focus should result in a narrower TMT attention scope. TMT cognitive and ideological diversity, thus, can be expected to be influential for the BMI process. By determining whether a broader or a narrower set of threat-opportunity cues are noted for altering the business model's interlinked content, structure and governance components, cognitive and ideological diversity may (mis)direct search and trial-and-error learning along certain paths to the exclusion of others (see also Snihur and Zott, 2019; Sosna et al., 2010). The argument, overall, is consistent with other research that points to managerial ability to sense or recognize important threats and opportunities pertaining to business model components as a crucial factor in the BMI process (see e.g., Chesbrough, 2010, Teece, 2018). Based on this discussion, we propose the following hypotheses:

Hypothesis 1: There is a positive relationship between TMT cognitive diversity and TMT BMI attention-scope.

Hypothesis 2: There is a positive relationship between TMT ideological diversity and TMT BMI attention-scope.

Research on group dynamics indicates that team variables' effects are conditional on the time a team has been together (Katz, 1982; Pelled et al., 1999). In line with this, in the upper-echelons literature, how effectively TMT executives interact with one another is viewed to depend on how long they have worked as a team (Hambrick et al., 1998; Nielsen and Nielsen, 2013). As effective interaction is all the more important for a complex, incremental process such as BMI, we expect TMT longevity to moderate positively the effects of TMT cognitive and ideological diversity on

BMI attention-scope. With TMT longevity, interaction norms become established, interpersonal communication improves and friction is reduced (Chatman and Flynn, 2001; Nielsen and Nielsen, 2013). Moreover, appreciation for others' way of being and doing grows, as do social bonding and trust (Hambrick et al., 1998; Harrison et al., 2003). Thus, with the passage of time, TMT longevity should strengthen the effects of TMT cognitive and ideological diversity by engendering more uninhibited and comprehensive sharing of executives' individual observations and insights regarding business-model content, structure and governance, thus enlarging team's BMI attention-scope. This discussion leads us to the following hypotheses:

Hypothesis 3a: TMT longevity will positively moderate the effect of TMT cognitive diversity on TMT BMI attention-scope.

Hypothesis 3b: TMT longevity will positively moderate the effect of TMT ideological diversity on TMT BMI attention-scope.

TMT Diversity and BMI Intensity

BMI intensity, in this study, refers to the number of BMIs introduced in a firm in the length of time a TMT is together. We expect BMI intensity to increase with TMT cognitive diversity. This is consistent with research which indicates that cognitive diversity in teams fosters innovation by sparking the creative ideation, pursuit and implementation of new product and process alternatives (Bantel and Jackson, 1989; Talke et al., 2010). As regards BMI in particular, with more TMT cognitive diversity, a team will have a larger pool of data, perspectives and understandings for basing trial-and-error experimentation on vis-à-vis business-model content, structure and governance. Because of this, different alternatives to tackle component interdependencies and to

reconcile legacy with novelty can be tried out, possibly as small-scale experiments (see Chesbrough, 2010), facilitating BMI. On the other hand, with less TMT cognitive diversity and a narrower bandwidth of data, perspectives and understandings, one can expect experimentation and BMI to decline. This is consistent with evidence from case-based research showing that a collective mental bias due to the dominant logic of an existing business model discourages managers from searching for alternative models (Chesbrough and Rosenbloom, 2002; Frankenberger et al., 2013). In sum, then, with greater TMT cognitive diversity to inform the process of business model experimentation, there is greater likelihood of discovery and implementation of feasible new-to-the-world or new-to-the-firm content, structure and governance combinations (see also, Martins et al., 2015; Sosna et al., 2010). Accordingly, the following hypothesis:

> ***Hypothesis 4***: There is a positive relationship between TMT cognitive diversity and BMI intensity in firms.

TMT ideological diversity too can be predicted to affect BMI intensity, but a bit differently. In a similar fashion to TMT cognitive diversity, greater ideological diversity should expand a team's pool of data, perspectives and understandings. When people have different ideological weltanschauungs, however, they can be expected to engage in more spirited discussions and debates about ends and means (cf. Carney et al., 2008; Stahl et al., 2010). In the business model context, this should translate into trial-and-error experimentation that is based on more thorough analysis of different content, structure and governance configurations informed by contrasting ideologies (cf. Abramowitz and Saunders, 2008; Graham et al., 2009). Thus, as compared to a

TMT that is less ideologically diverse, a more diverse TMT should be less prone to groupthink and should have a larger set of vigorously examined alternatives to test, which increases the odds of a team being able to find and introduce viable new business-model content, structure and governance combinations. However, one may expect a positive effect on BMI only up to a certain level of TMT ideological diversity. Research suggests that when people's values diverge a lot, people distance themselves from one another, becoming polarized (Abramowitz and Saunders, 2008; Brandt et al., 2014). There is thus a risk to too much diversity of values. It may foil communication and cooperation, and executives may discount and ignore one another's input because of ideological biases (cf. Kirkman and Shapiro, 2005; van Knippenberg et al., 2010). Consequently, while the effect of TMT ideological diversity on BMI can be expected to be positive at first, it is likely to become negative at higher levels of ideological diversity. Formally:

> ***Hypothesis 5***: There is an inverted-U relationship between TMT ideological diversity and BMI intensity in firms.

One can expect TMT longevity to moderate positively the effects of TMT cognitive and ideological diversity on BMI intensity. As argued earlier, if a TMT is together longer, the quality of interpersonal interactions should become better (Harrison et al., 2003; Smith et al. 1994). And, as time spent together increases and TMT members develop a shared language and routines and protocols (Schippers et al., 2003; Schubert and Tavassoli, 2020), it should become easier to coordinate actions. Thus, as the initial hiccups faced by a new team, because of members not knowing one another and not having worked together, fade (Eisenhardt and Schoonhoven, 1990; Michel and Hambrick, 1992), TMT longevity should augment the positive effects of TMT cognitive and ideological diversity on BMI intensity. Furthermore, TMT longevity should also

counteract the negative effect of high TMT ideological diversity on BMI intensity. As trust and understanding increase and there is respect for one another's norms and values, constructive interactions should replace ideology-based differences and biases, reversing the negative relationship between high TMT ideological diversity and BMI intensity. The argument resonates with Harrison et al.'s (1998) finding that work-group longevity increases the effect of "deep-level" diversity in beliefs and values. The foregoing discussion leads us to predict that:

> ***Hypothesis 6a*:** TMT longevity will positively moderate the effect of TMT cognitive diversity on BMI intensity.

> ***Hypothesis 6b*:** TMT longevity will positively moderate the effect of TMT ideological diversity on BMI intensity.

METHODS

Sample and Data Collection

To test the hypotheses, we focused on SIC 27 companies in the printing and publishing (P&P) industry. This sample is particularly appropriate because changes in technology, competition and customer needs have meant that BMI has been and remains a pertinent and important consideration for the companies in the industry. Over the decades, a variety of changes have injected dynamism into the industry including, the 1980s superstore revolution in book retailing, Amazon's novel business model in the 1990s, and the rapid development of online shopping after 2000 (Greco et al., 2013). We included in our sample all 23 publicly listed firms on the NYSE that were operative for all years from 2003 to 2013, a period characterized by increase in online commerce and consumption, digitization of content, and emphasis on user involvement in output creation (Carreiro, 2010). This balanced panel provided us 253 firm-years of data pertaining to 156 TMT

combinations in the sampled firms. In line with previous research, we used SEC filings (10-k forms) to identify TMT members, who were executives at the level of vice president or above (Cho and Hambrick, 2006). The average TMT size was seven, and the range was 15. Furthermore, the length of time a TMT had been together ranged from one to 11 years.

The data was collected from different sources. Information regarding the age, education, gender, functional expertise, and nationality of TMT members was obtained from and validated by consulting multiple data sources: BoardEx, ExecuComp, ThomsonOne, Bloomberg Businessweek archives, company websites, and the LinkedIn profiles of executives. Raw data to establish TMT members' conservative-liberal orientation was sourced from the U.S. Federal Election Commission (FEC). To establish TMTs' BMI attention-scope, we examined the content of companies' Annual Reports. With respect to BMI intensity, we reviewed business-press archives, industry reports and the business literature to compile and validate a list of all notable innovations introduced after 1993 in P&P firms' business models. We used the list to determine which and how many of these innovations were introduced in the companies in our sample during the period in which a specific TMT was in charge. This provided us the estimate of BMI intensity for all TMTs in our sample. Finally, companies' financial data was obtained from the income statements and balance sheets included in the companies' Annual Reports.

Variables and Measures

TMT cognitive diversity. Consistent with the variable's conceptualization as the degree to which there is variety in team members' knowledge and intellectual perspectives, we developed a measure of TMT cognitive diversity by considering the variance in age, educational attainment, gender, functional specialism and nationality of team members. While with respect to team

members' age we calculated the coefficient of variance, for the other four categorical indicators we employed Blau's index $1 - \Sigma p_i^2$ to determine variance, where p_i denotes the proportion of group members in the ith category. We normalized and scaled the scores for individual elements so that they ranged from zero to one, and then took their geometric aggregation as the indicator of the overall measure. There were three categories of educational attainment – bachelor (n = 115 executives), master (n = 178 executives) and doctoral (n = 43 executives); two gender categories – male (n = 251 executives) and female (n = 85 executives); six functional categories (Bunderson and Sutcliffe, 2002) – finance (n = 79), general administration (n = 44), manufacturing / operations (n = 21), marketing and sales (n =43), technical (n = 84), and other (n = 65); and six nationality categories – Canada (n = 27), China (n = 1), Denmark (n = 1), Netherlands (n = 2), the U.K. (n = 9) and the U.S. (n = 296)). In addition, the age of the executives ranged from 32 years to 74 years, with a mean of 49.5 years and a standard deviation of 7.2 years.

TMT ideological diversity. In line with recent studies (Chin et al., 2013; Gupta et al., 2018), we developed a measure of TMT ideological diversity by considering the degree to which team members espoused the more conservative stance of the Republican Party as opposed to the more liberal stance of the Democratic Party. Specifically, we assembled publicly available data on TMT members' donations to Republican and Democratic causes maintained by the U.S. Federal Election Commission (FEC). The FEC is an independent regulatory agency in charge of campaign finance monitoring; it records all individual contributions that exceed the amount of $200, as well as the contributor's name, state, city, street address, zip code, occupation, employer, the name of the recipient, the donation amount, and the donation date. Using the FEC database, we established the pattern of donation of each executive in our sample by aggregating the donations he/she had made in the ten years prior to becoming a TMT member. Particularly, we calculated two indicators

reflecting an executive's behavioral and financial commitment (Chin et al., 2013), and averaged them to arrive at an executive's ideology score on the conservative-liberal continuum.

As regards the first indicator, we calculated the number of donations an executive had made to the Democratic Party (i.e., to individuals, committees, and political action committees (PACs) linked to the Democratic Party) and divided this by the number of donations he/she had made to both political parties. As regards the second indicator, we calculated the dollar amount of donations an executive had made to the Democratic Party and divided this by the dollar amount of donations he/she had made to both political parties. In relation to both indicators, to handle zero values we added 0.1 to all numerators and 0.2 to all denominators. The indicator scores ranged from zero to one; by construction, scores below 0.5 can be interpreted to reflect a greater degree of conservatism and scores above 0.5 a greater degree of liberalism. As the final step, to arrive at the TMT ideological diversity scores, we calculated the coefficient of variance of team members' individual ideology scores.

TMT longevity. To measure this, we counted the number of years TMT membership had remained unchanged (Pelled et al., 1999). The variable's value ranged from one to seven years.

TMT's BMI attention-scope. To determine BMI attention-scope, we did a computer-aided text analysis (CATA) of companies' Annual Reports. Such analysis has become an accepted approach for studying executives' attention focus (Cho and Hambrick, 2006; Nadkarni and Barr, 2008). The analysis centered on determining whether TMTs' attention was relatively more concentrated or more distributed across business-model content, structure, and governance elements (Zott and Amit, 2010). Towards this end, we sought to identify views and thoughts contained in Annual

Reports that centered on changing or revising business-model content, structure, and governance, which would indicate a TMT's range of attention. Our aim was to establish TMTs' BMI attention-scope on a four-point scale, with zero representing the absence of attention to any business-model element, and the maximum score of three representing attention to all three elements. To ensure that CATA would provide reliable and valid measurements, we developed a search dictionary (SD) capable of identifying relevant references to business-model elements in the Annual Reports.

As the first step in developing the SD, because the business-model content, structure, and governance elements refer respectively to a business-model's core *activities*, the *linkages* among them, and the *roles* and responsibilities assigned for carrying out the activities, we designated *activities*, *linkages* and *roles* as the basic SD terms for identifying pertinent textual passages in the Annual Reports (Krippendorff, 2004). Because the language used in Annual Reports can vary, to ensure CATA did not overlook relevant textual passages, we consulted the Cambridge business-English and Merriam-Webster dictionaries to expand the SD by including close synonyms and terms associated with the basic terms. To establish SD's face validity, we asked three colleagues knowledgeable about the business-model literature to evaluate the SD for completeness and relevance. Based on their feedback, we removed five items from the SD that were either redundant or were not specific to one of the business model elements, and included three additional ones. The refined SD consisting of 22 terms is shown in Table I.

With this SD, we ran sentence-level compound queries using ATLAS.ti 8 program to identify text in Annual Reports connected to one or more of the three business model elements. To identify textual material pertaining particularly to *change* in business model elements, the compound queries included stems of words linked to "change", namely improv*, innov*, modif*, new*,

novel*, replac*, simplif*, strateg*, transform*, unprecedent* (Krippendorff, 2004). To establish the validity of the CATA-identified texts, one of the authors of this article and an M.Sc. student familiar with the research topic manually inspected each CATA-identified text, independently of one another, to establish whether it was indeed connected to business-model elements, and was thus relevant. The two reviewers were in agreement about a text's relevancy in 96% of the cases. Taking into consideration only those texts the reviewers agreed were relevant, a score of zero to three was assigned for TMT BMI attention-scope depending on how many of the three business-model elements had featured explicitly in a firm's Annual Report in a given year.

Insert Table I about here

BMI intensity. The variable was operationalized as the number of major BMIs introduced by a TMT in the period (in years) in which it was in charge in a company. To establish BMI intensity, we first reviewed business press archives, industry reports and the business literature to determine all major innovations in P&P firms' business models starting from the year 1993 (i.e., ten years before our panel-data period of 2003 – 2013). Following Baden-Fuller and Haefliger (2013), major BMIs are those that alter customers' identification and engagement with a company, or alter the company's value chain and linkages between value-chain activities, or alter the firm's revenue model in terms of the cost or pricing logic followed (see also, Foss and Saebi, 2017). We identified 15 such BMIs in the industry, which are shown in Table II.

Insert Table II about here

Two industry experts – a senior official at the trade association of Printing and Publishing companies and an academician who specializes in the publishing industry – verified that our list included all principal BMIs. At this point, one of the article's authors and one M.Sc. student familiar with the research, independently of one another, reviewed the Annual Reports of the companies in the sample, companies' press releases, and business-news articles to establish in which year the BMIs on the verified list had been introduced, if at all, in the sampled companies. There was a high level of inter-rater consistency, 0.92, and the few disagreements regarding the year in which a particular company had introduced a particular BMI were easily resolved. We tabulated this data to record BMI intensity as the ratio of BMIs a TMT had introduced in a company, to the number of years the TMT had been together. Thus, if a TMT had introduced two BMIs in the four years it had been in charge in a company, the BMI intensity was recorded as 2 / 4 = 0.5. BMI intensity ranged in our dataset from zero to five.

Control Variables. We controlled for a range of variables that may possibly affect BMI attention-scope and BMI intensity. At the company level, we controlled for firms' age because older firms may face greater pressure to change their business model, which may influence attention scope and BMI intensity. Next, because firm size may be a structural barrier to business-model change, we controlled for it by taking firms' total assets (in millions of dollars) into account. Furthermore, because past performance may affect attention scope and BMI, we accounted for this by using the ratio of net income to sales as the indicator of performance. Moreover, we controlled for firm slack (i.e., the ratio of current assets to current liabilities) and firm leverage (i.e., the ratio of total debt to total equity), both of which capture structural barriers to BMI by indicating the financial resources available to a firm. At the TMT level, we controlled for TMT longevity because teams that have been together longer may differ from others in their attention scope and BMI. We also controlled for TMT size, as the dynamics of larger teams could differ from those of smaller

teams (e.g., Bosboom et al., 2019) to affect attention scope and BMI intensity. In addition, we also controlled for possible time-related effects by including year dummies in the analyses.

ANALYSIS AND RESULTS

As our longitudinal dataset includes repeated observations of the same companies over a ten-year period, we used the Generalized Estimating Equations (GEE) method for data analysis. The method is suitable for our data because it can handle non-independent observations by allowing the estimation of the correlation structure of error terms (Liang and Zeger, 1986). We used the "xtgee" command in STATA 14.1. For all models that were estimated, we specified a Gaussian (i.e., normal) distribution, an identity link function, and an exchangeable correlation structure. Furthermore, appropriately for a balanced panel such as ours, we used robust variance estimators (White, 1980). In addition, to avoid multicollinearity, we used mean-centered values of variables to create interaction terms for testing moderation effects.

For testing the effects of TMT diversity on BMI attention-scope, the 23 firms in our sample were treated as the panel variable and the firms' yearly observations from 2003 to 2013 as the within-panel time variable, providing 253 firm-year observations. Annual Reports, which were the source of data regarding TMTs' attention focus, are filed in the first quarter of a year. We, therefore, incorporated a one-year lag in the analysis by predicting BMI attention-scope in year *t* based on the year *t – 1* values of explanatory variables. To test hypotheses about TMT diversity's impact on BMI intensity, we organized the data a bit differently. As the dependent variable captured the number of BMIs introduced by TMTs in the length of time they had been together, the analysis centered on the 156 unique firm-TMT observations in the sample. The 23 firms in the sample were again treated as the panel variable, but we dispensed with the within-panel time

variable as it was not relevant for this specific analysis.

Table III shows the raw statistics and bivariate correlations. There is sufficient variance in the measures of the study's variables and no correlation coefficient is unusually high. Table IV shows the regressions results for TMTs' BMI attention-scope. Model 1 includes the control variables only; Model 2 includes the controls and the main explanatory variables – TMT cognitive diversity and TMT ideological diversity; Model 3 includes the interaction term for the moderation effect of TMT longevity in relation to TMT cognitive diversity; and Model 4, the full model, includes also the interaction term to test for the moderation effect of TMT longevity in relation to TMT ideological diversity. Not very surprisingly, the results indicate that TMTs' BMI attention-scope tends to be significantly less in older firms and in larger firms. In support of Hypothesis 1, the results also indicate a significant positive effect of TMT cognitive diversity on BMI attention-scope ($b = 0.56$; $p < 0.01$). In terms of effect size, at mean values of the model's covariates, one S.D. change in TMT cognitive diversity leads to 1.36% increase in TMT's BMI attention-scope[2]. Thus, the attention-scope of a team with cognitive diversity at the maximum level in the sample is nearly five times greater than that of a team with average cognitive diversity. Hypothesis 3a regarding the moderating effect of TMT longevity is also supported ($b = 0.27$; $p < 0.01$). At mean values, one S.D. change in TMT longevity increases the impact of one S.D. change in TMT cognitive diversity by another 1.25%. Figure I illustrates this interaction effect visually. Against predictions, though, the results do not indicate support for Hypothesis 2 and Hypothesis 3b concerning the direct and moderating effect of TMT ideological diversity and TMT longevity.

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[2] Effect size is calculated as the exponent of 1 S.D. change in the explanatory variable multiplied by the relevant estimated coefficient. Thus, effect size of TMT cognitive diversity is 10^ (0.24 X 0.56) = 1.36.

Insert Tables III and IV and Figure I about here

Table V presents the regressions results for BMI intensity. Model 5 in Table V includes the firm-level and TMT-level control variables described earlier, as well as a control for TMT's average BMI attention-scope in the years it was in charge. Model 6 includes the controls, TMT cognitive diversity, and TMT ideological diversity and its squared term as predictors. In Model 7, the interaction term to test for the moderation effect of TMT longevity in relation to TMT cognitive diversity is included. Model 8 also includes the interaction terms to test for the moderation effect of TMT longevity in relation to TMT ideological diversity. The results indicate that BMI intensity is greater in the case of older firms, possibly driven by the necessity of switching over from dated business models to newer ones to remain competitive. Firm size, in contrast, appears to have a negative influence on BMI intensity, which is consistent with the frequent display of inertia by larger organizations. In addition, BMI intensity is also less when a firm is more leveraged, plausibly because of less willingness to assume BMI risk when there is more debt exposure. Furthermore, as may be expected, BMI intensity is greater when TMTs' BMI attention-scope is broader. Notably, however, the results do not lend support to Hypothesis 4. TMT cognitive diversity's coefficient, rather than being positive as hypothesized, is negative ($b = -0.23$; $p < 0.10$). In effect-size terms, one S.D. increase in cognitive diversity at average values decreases BMI intensity by more than a percentage point. Interestingly, supporting Hypothesis 6a, TMT longevity does moderate the effect of TMT cognitive diversity positively ($b = 0.29$; $p < 0.01$). As shown in Figure II, TMT cognitive diversity's impact on BMI becomes positive when executives have been together longer as a team.

Furthermore, results show strong support for Hypothesis 5, which suggested a nonlinear inverted-U effect of TMT ideological diversity on BMI intensity – the coefficient of the base term is positive and significant ($b = 0.66$; $p < 0.01$), that of the squared term is negative and significant ($b = -0.72$; $p < 0.05$). Substantively, these coefficients imply that whereas one S.D. increase in TMT ideological diversity at lower levels of the variable is on average associated with almost two percent increase in BMI intensity, one S.D. increase at higher levels of the variable is associated with almost two percent decrease in BMI intensity. Furthermore, Hypothesis 6b is also verified – the interaction coefficients involving TMT longevity and the base and squared terms for TMT ideological diversity are negatively ($b = -0.32$; $p < 0.05$) and positively ($b = 0.57$; $p < 0.05$) significant. TMT longevity attenuates, thus, the negative effect of high TMT ideological diversity on BMI intensity. Figure III illustrates the interaction, showing the gradually waning impact of ideological diversity at low level of TMT longevity (one S.D. below the mean), but a sharply increasing effect at high level of TMT longevity (one S.D. above the mean).

Insert Table V and Figure II and III about here

Supplementary Analysis

When doing empirical research, it is judicious to be careful about potential endogeneity (Hamilton and Nickerson, 2003). It is conceivable, for example, that TMT diversity and BMI in firms may co-vary because of an omitted variable such as the degree to which firms are liberal or progressive. As this can result in biased estimates, we controlled for it using multiple instruments (Baum, 2006) based on U.S. state-level data corresponding to the states in which the sample firms had their

headquarters. The instruments comprised five exogenous variables that can affect how open-minded and forward-thinking a firm is: percentage of votes cast in a state for a Democratic presidential candidate in the most recent election cycle; gender pay gap in a state; recognition of same sex marriage in a state; recognition of workplace LGBT rights in a state; and percentage of state's inhabitants with no religious affiliation. Following recent work (Sidhu et al., 2020; Tang et al., 2018), we did a two-stage estimation for endogeneity correction (Wooldridge, 2010). First, we regressed TMT cognitive and ideological diversity on the study's firm-level explanatory variables and the five state-level exogenous variables. Next, the residuals from the first-stage estimations were included as controls in the second-stage model for predicting BMI intensity. The procedure did not result in any significant change in the results obtained without the endogeneity correction.

We also tested the sensitivity of the results to changes in model specification. In this respect, the inclusion of a two-year lag, instead of a one-year lag, did not alter the results substantively – as before, TMT ideological diversity did not have an effect. The significance levels of the direct and moderated effects of TMT cognitive diversity declined though, which is consistent with what may be expected – teams' cognitive make-up is likely to affect attention closer in time rather than further in time. We furthermore examined whether the reported direct and moderated effects of TMT cognitive diversity would continue to hold with the inclusion of the dependent-variable's lagged value – this was indeed the case. In addition, responding to a query during the review process, we also tested for an inverted-U effect of TMT cognitive diversity on BMI intensity. We had not proposed such an effect above because polarization, and breakdown in communication and cooperation tend to be associated with differences in values rather than with differences in intellect. The testing did not indicate support for an inverted-U effect of TMT cognitive diversity. This outcome suggests that although TMT cognitive diversity may keep a team from being at its

most effective initially, when team members have not had much experience of working together, unlike TMT ideological diversity, it does not have a negative effect on BMI intensity.

In addition, we also examined the possibility of bias on account of sample selection. As noted earlier, we included only those firms in our sample that were listed on the NYSE for the entire 2003-2013 period. As the firms were not selected in or out of the sample because of the dependent variable, one need not be concerned about sampling bias on account of non-random selection (e.g., Winship and Mare, 1992) connected to BMI. It is conceivable, though, that firms that were not on the exchange for the entire 2003-2013 period, may have differed systematically from those that were as regards TMT diversity. To check this, we collected data for the eight SIC 27 firms that were not in our sample but were on the NYSE between 2003 and 2013 for periods ranging from four to seven years. We established the TMT cognitive and ideological diversity scores of these firms for the years they were on the exchange. We then compared these scores with those of the sampled firms using Welch's t-test of differences in mean values. The tests were not statistically significant, indicating that the TMT diversity scores of the two sets of firms did not differ meaningfully.

DISCUSSION AND CONCLUSION

As societal developments continue to make the workforce more heterogeneous, calls have become stronger for greater representation of this diversity in the upper echelons of management. Although the pros and cons of diversity in organizations and in organizational work-groups have been studied for a long time, and have been the subject of much academic and public debate, relatively little is known about the consequences of cognitive and ideological diversity in the top management teams of companies – arguably because till the turn of the century, TMTs were not

as diverse as they are today; and, because it has been challenging to identify and measure empirically some centrally-relevant ideology dimension with reference to which executives differ meaningfully (Chin et al., 2013). In this study, therefore, we set out to examine how TMT cognitive and ideological diversity are likely to influence business model innovation in companies. Timely BMI is a crucial challenge for firms in today's competitive business environment, and one whose complexity requires TMT members to complement one another and work effectively as a team (see also, Foss and Saebi, 2017).

Building on work that characterizes BMI as a process of search, experimentation and discovery, (Snihur et al., 2018; Sosna et al., 2010), we predicted the effects of TMT cognitive and ideological diversity on BMI attention-scope – a team-level psychological construct, and on BMI intensity – a firm-level outcome. We tested these predictions using longitudinal panel data from firms in the printing and publishing industry. While the empirical results, overall, support the predictions, they also include unforeseen findings that offer useful insights. As theorized, we found greater TMT cognitive diversity to increase a team's BMI attention-scope, an effect that tends to become stronger with team longevity. The finding confirms that the diversity of thought executives' different life experiences contribute to a TMT has benefit to it – namely, it channels a team's collective attention to a broader range of cues concerning business model content, structure and governance. But, contrary to what we had predicted, greater TMT ideological diversity did not increase a team's BMI attention-scope. This suggests that differences in team members' value systems (cf. Jehn et al., 1999; Klein et al., 2011), arguably, engender reluctance in the sharing of one's BMI attention-focus with those who embrace a different ideology.

As another unanticipated finding, we observed that greater TMT cognitive diversity affects BMI intensity negatively. Thus, although TMT cognitive diversity expands a team's BMI attention-scope, at first glance it does not seem to increase the introduction of BMIs in a firm. This result echoes earlier findings of a negative effect of cognitive diversity on team outcomes, either because diversity impedes communication and interaction between team members (cf. Miller et al., 1997; Østergaard et al., 2011), or perhaps because it triggers task-related conflict in the form of discord on which course to follow (Olson et al., 2007; Simons and Peterson, 2000). Notably, though, we found that TMT longevity moderated positively the negative impact of TMT cognitive diversity, revealing that the latter can potentially promote BMI. The moderated effect is consistent with other work that has argued and found that the negative effect of cognitive diversity tends to disappear as team members' experience of working together increases and the initial communication and interaction difficulties are resolved, and a team develops routines and mechanisms to work through disagreements to pursue members' shared interest in the well-being of the firm (see e.g., Harrison et al., 2003; Schubert and Tavassoli, 2020).

Furthermore, we also found support for the argument that TMT ideological diversity's effect on BMI intensity is likely to be curvilinear. While ideological diversity is initially beneficial, too much of it is detrimental to BMI. When TMT executives hold very different values, it can cut the amount and quality of communication between them, setting back the exchange and integration of data, perspectives and understandings (cf. Brandt et al., 2014; van Knippenberg et al., 2010) that could have otherwise enabled BMI. This negative effect of high TMT ideological diversity is attenuated by TMT longevity, however. Plausibly, as TMT executives work together longer, the buildup of trust and understanding ensures that communication and cooperation do not suffer even

with substantial differences in members' ideologies. Because our study is the first to investigate the effect of TMT ideological diversity on BMI, it offers singular insight – apparently, even larger ideological differences can be of value to the BMI process if they can be harnessed to advantage. We should also note that the different effects of TMT cognitive and ideological diversity we found underscore the need for more holistic models that account for different types of diversity. This is important for building fuller understanding of the implications of different diversity types, as the managerial upper echelons in companies become more diverse.

As contribution to diversity research, this article speaks to and reinforces the recent call for a temporal perspective on diverse teams (Srikanth et al., 2016) – one that takes the passage of time into account conceptually and methodologically. As Harrison and his colleagues (2002, p. 1029) note, "time serves as a medium for collaboration in teams". Our results show that diversity's effects can be either negative or positive, depending on the length of time team-members have worked together to accumulate experience that allows them to collaborate effectively to reap the benefits of their differences. Field research on managerial diversity is often based on observations at a single point in time, which does not allow one to consider changes in team, firm, and industry-level variables over time. Our use of longitudinal data in this study offers encouragement to researchers interested in modeling diversity's effects over time, perhaps in other settings and on additional variables such as product innovation and financial performance. In the meantime, the overall message to come from this study is one of optimism. Amidst the impassioned rhetoric championing either globalization or nationalism, monism or pluralism, supra or sub-identities, this research indicates that diversity in organizations can be a force for positive change – one that helps firms transform in a mutating world. To have this effect, diversity needs time and nurturing to allow a better understanding of the other to form.

As contribution to the literature on business models, this study builds on and takes forward research on business models as activity systems, the innovation of which is a process of trial-and-error learning (Snihur et al., 2018; Sosna et al., 2010). At this point in time, we have little understanding of the influence TMTs have on the process, although as Foss and Saebi write, "[*b*]*ecause changing the BM is a central top-management task, there is a potentially very fruitful link to TMT theory*" (Foss and Saebi, 2018, p. 21). In this context, our study throws light on the effect TMT diversity – cognitive and ideological – has on the process. Cognitive diversity affects BMI attention-scope, with more diversity expanding TMT's awareness of BMI impediments and opportunities concerning business-model content, structure and governance. Additionally, the study shows that both TMT cognitive and ideological diversity promote the introduction of BMIs in a firm. The study in this regard is aligned with and complements other recent work. Consistent with the argument of Martins et. al. (2015) that BMI starts as a change in cognitive schemas, our study points to TMT diversity as an important catalyst for schema changes. And, our study's argument that TMT's cognitive and ideological make-up influences BMI search echoes Snihur and Zott's (2019) assertion that thinking patterns can affect the scope of search for new business models.

We also contribute to the upper-echelons literature. In the last few years, there has been great interest in understanding how the ideology of executives on the conservative-liberal axis affects strategic decisions and outcomes. While some of this work has examined the impact of CEOs' personal ideology (Chin et al., 2013; Gupta et al., 2018), other work has examined how the collective average score on the conservative-liberal spectrum affects the decisions of boards of directors (Gupta and Wowak, 2017) and of a company (Gupta et al., 2017). We add to this stream

of research by focusing on the ideologies of TMT executives, and by theorizing and showing that variance in their ideologies can be of consequence and is thus deserving of attention. In this regard, while clearly there is value to studying the effect of a group's average ideology score, it is also important to examine the effect of variance in team members' ideologies. Tensions and relational dynamics among executives, which determine cognitive and behavioral outcomes, may have origin in the degree to which executives hold similar or dissimilar values. Especially as people's positions on the conservative-liberal axis have begun to play a bigger role in social interactions, it seems important to examine how differences in values shape TMT dynamics and innovation outcomes.

An important managerial implication of this study is that companies stand to gain from having a more diverse TMT. As companies find themselves under pressure to redesign business models in response to competitive dynamics, having a team of executives whose mindsets differ can potentially provide a competitive edge. Although variety in executives' cognition and ideology can be beneficial, there is however a caveat. The benefits of diversity appear to be conditional on the longevity of a team. To make TMT diversity work to advantage, then, a key challenge for companies might be to ensure that team members pull together despite their cognitive and ideological differences and despite any initial difficulties in getting along. In this regard, administrators would do well to remember that managing business model change involves managing the varied demands of different stakeholders and the fluctuating interdependencies in the marketplace, a balancing act that is probably best performed by a heterogeneous team.

Limitations and Avenues for Future Research

No scholarly investigation is perfect and complete on its own, which is also true of this work; its shortcomings provide fruitful opportunities for further research. We tested the study's hypotheses using data from a single industry, which facilitated the isolation of TMT diversity's influence on BMI because all firms in the sample faced similar exogenous forces in the observation period. With a heterogeneous sample, it would have been difficult to establish the relationship with the same confidence because variation in BMI may be driven more by differences in firms' external context rather than differences in the TMT. What our approach throws light on is that similarly placed firms can differ considerably in terms of attention to and intensity of BMI on account of more/less TMT diversity. A firm's TMT would thus appear to be an influential factor in relation to BMI. To ascertain that this conclusion also holds in other industry settings, in the future it is important to test this study's hypotheses with data from different industries.

Additionally, as this study's focus was on TMT diversity's impact in firms that have a homogenous product portfolio, we did not delve into the issue that depending on firms' scope, one could identify BMI at a product level, BU level or firm level. For a more fine-tuned understanding of BMI, future research that circumscribes different levels would be valuable. Furthermore, scholars may want to consider measuring TMT cognitive and ideological diversity using other approaches and proxies. A confirmation of our findings using other methods and instruments would provide important corroboration. For instance, researchers could gather data on TMT cognitive and ideological diversity using psychometric scales. A downside of surveys however is that it precludes the collection of longitudinal data about past TMTs, and is dependent on the commitment of multiple executives in a company, which may not be easy to get. We also did not distinguish between TMT diversity's effect on new-to-the-world and new-to-the-firm BMIs. As

the issues and challenges surrounding these two types of BMIs may differ, it is possible that the two are affected somewhat differently. It would be interesting to explore this in future research.

An expansion of the theory developed and tested in this paper to determine whether and to what extent the effect of TMT diversity on BMI intensity is mediated by TMT BMI attention-scope constitutes another important avenue of future research. We could not test for mediation and thus the relative magnitude of direct and indirect effects of TMT diversity because we were obliged to test its effect on BMI attention-scope at the firm-year level, but its effect on BMI intensity by organizing the data at the TMT level. A research design that circumvents the data issue we faced would be helpful. Furthermore, a reviewer pointed to the interesting possibility that in addition to the absolute level of TMT diversity, change in TMT diversity because of a new TMT may also matter for BMI. Although we did not find this to be the case in our sample, the issue is important and merits further examination using other samples.

It is evident from the discussion in this concluding section that the quest to develop a comprehensive understanding of TMT's effects on BMI process and outcomes has only just started. We hope that our investigation of the effects of TMT cognitive and ideological diversity on BMI attention-scope and BMI intensity will encourage others. Ongoing changes in social composition and order have rendered diversity and inclusiveness in organizations a momentous issue. A rich understanding of the implications of diversity and how to manage it to advantage should permit management scholars to make important contributions to the key social discourses of our times.

TABLES

Table I. CATA search dictionary – terms related to business model elements

Activities	*Linkages*	*Roles*
Activ*	Alliance	Authority
Project	Architecture	Contribut*
Scheme	Mechanism	Control
Task	Network	Duty
Undertaking	Partner*	Leadership
Venture	Provider	Position
	Supplier	Rol*
	Value chain	Responsib*

"*" CATA extracted all suffixes following the word stem.

Table II: Prominent business model innovations in Printing & Publishing Industry

Business model innovations [a]	*Early adopter*	**First adoption**	*Number of adopting firms (2003-2013)*
Customer-engagement altering:			
1. Digital-only subscription model	The New York Times	2005	4
2. Use of Web video as promotional tool	Thomson Reuters	2007	15
3. Social-media based marketing	Gannett Corp.	2008	16
Value-chain altering:			
4. Editorial services	Wiley (John) and Sons	Pre 2003	3
5. E-learning resources	Pearson PLC	Pre 2003	5
6. Adoption of e-commerce	Champion Industries	Pre 2003	19
7. Interactive online platform	Champion Industries	Pre 2003	18
8. Adoption of digital publishing	Multiple	2003	14
9. Marketing and distribution services	Ennis Corp.	2003	8
10. Adoption of smartphone Apps	The New York Times	2005	14
11. Online video as a product	Meredith Corp.	2007	2
12. Self-publishing & other author services	Cenveo Corp.	2010	2
Revenue-model altering:			
13. Hybrid publishing formats	Pearson PLC	2003	9
14. Non-linear publishing formats	Gannett Corp.	2003	2
15. Social-publishing formats	Multiple	2007	9

[a] The categorization of BMIs as customer-engagement, value-chain, and revenue-model altering is only to highlight the aspect that changed most prominently; it is not to suggest that there was no change in other aspects.

Table III: Summary statistics and bivariate correlations

Variables	Min.	Max.	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1. Firm age	11	206	106.5	47.03	~										
2. Firm size	1	253	127.0	73.20	-0.03	~									
3. Firm performance	-1.21	0.28	0.04	0.14	0.08	-0.04	~								
4. Firm leverage	-36.1	104	2.17	10.3	0.09	0.03	-0.10	~							
5. Firm slack	0	4.49	1.36	0.87	-0.25*	0.11	-0.08	0.01	~						
6. TMT size	2	17	6.47	3.35	0.49*	-0.32*	-0.02	0.07	-0.23*	~					
7. TMT longevity	1	7	1.76	1.47	-0.29*	0.21*	0.03	-0.01	-0.02	-0.31*	~				
8. TMT cognitive div.	0	0.97	0.10	0.24	0.44*	0.12*	0.14*	-0.07	-0.13*	0.17*	-0.01	~			
9. TMT ideological div.	0	1.28	0.29	0.32	0.19*	-0.14*	-0.03	0.01	0.08	-0.01	-0.16*	0.05*	~		
10. BMI attention-scope	0	3	2.42	0.91	-0.07	-0.19*	0.02	-0.01	0.22*	0.17*	-0.06	0.12	-0.16*	~	
11. BM innovations	0	5	0.59	1.05	0.07	-0.09	-0.01	0.00	-0.09	0.10	-0.10	0.07	0.14*	0.10	~

*N=253. *p < 0.05.*

Table IV. GEE results for TMTs' BMI attention-scope

	Model 1		*Model 2*		*Model 3*		*Model 4*	
Firm age	-0.22*	(0.13)	-0.28**	(0.11)	-0.27**	(0.11)	-0.26**	(0.11)
Firm size	-0.01**	(0.00)	-0.01**	(0.00)	-0.01**	(0.00)	-0.01**	(0.00)
Firm performance	-0.23	(0.22)	-0.22	(0.21)	-0.11	(0.33)	-0.22	(0.21)
Firm leverage	-0.01	(0.01)	-0.01	(0.01)	-0.00	(0.00)	-0.01	(0.01)
Firm slack	0.06	(0.12)	0.07	(0.12)	0.06	(0.11)	0.07	(0.12)
TMT size	0.03	(0.03)	0.03	(0.03)	0.02	(0.03)	0.03	(0.03)
TMT longevity	-0.01	(0.03)	-0.12	(0.03)	-0.00	(0.02)	-0.03	(0.03)
TMT cognitive diversity			0.57***	(0.16)	0.54***	(0.19)	0.56***	(0.19)
TMT ideological diversity			-0.06	(0.25)	-0.11	(0.24)	-0.18	(0.23)
TMT cognitive diversity X TMT longevity					0.22***	(0.03)	0.27***	(0.06)
TMT ideological diversity X TMT longevity							-0.17	(0.12)
Intercept	3.27***	(0.65)	3.53***	(0.56)	3.49***	(0.54)	3.47***	(0.57)
Wald's chi-square	61.75***		155.53***		496.42***		596.80***	

N = 253. Standard errors are in brackets. Year dummies included but not shown.
* p < 0.10; ** p < 0.05; *** p < 0.01.

Table V. GEE results for BMI intensity

	Model 5		*Model 6*		*Model 7*		*Model 8*	
Firm age	0.35***	(0.06)	0.20***	(0.04)	0.20***	(0.04)	0.22***	(0.05)
Firm size	-0.01**	(0.00)	-0.00	(0.00)	-0.01*	(0.00)	-0.01*	(0.00)
Firm performance	-0.34	(0.28)	-0.23	(0.31)	-0.28	(0.46)	-0.21	(0.33)
Firm leverage	0.01	(0.01)	-0.01**	(0.00)	-0.01**	(0.00)	-0.01**	(0.00)
Firm slack	0.11**	(0.04)	-0.06	(0.05)	-0.06	(0.05)	-0.06	(0.04)
TMT size	0.02	(0.01)	0.01	(0.01)	0.02	(0.03)	0.01	(0.01)
TMT longevity	0.08***	(0.02)	0.02	(0.03)	-0.06	(0.04)	-0.06	(0.04)
TMT BMI attention-scope	0.10***	(0.03)	0.07**	(0.03)	0.07**	(0.03)	0.06**	(0.03)
TMT cognitive diversity			-0.27**	(0.12)	-0.25*	(0.11)	-0.23*	(0.12)
TMT ideological diversity			0.73***	(0.14)	0.75***	(0.14)	0.66***	(0.13)
TMT ideological diversity squared			-0.84***	(0.30)	-0.87**	(0.31)	-0.72**	(0.27)
TMT cognitive diversity **X** TMT longevity					0.17***	(0.08)	0.29***	(0.07)
TMT ideological diversity **X** TMT longevity							-0.32**	(0.14)
TMT ideological diversity squared **X** TMT longevity							0.57**	(0.24)
Intercept	-1.58***	(0.26)	-0.51*	(0.27)	-0.42	(0.28)	-0.36	(0.28)
Wald's chi-square	200.8***		1976.5***		4335.1***		4375.6***	

N = 156. Standard errors are in brackets. Year dummies included but not shown.
* p < 0.10; ** p < 0.05; *** p < 0.01.

Figure I. Effect of TMT cognitive diversity and longevity on BMI attention-scope

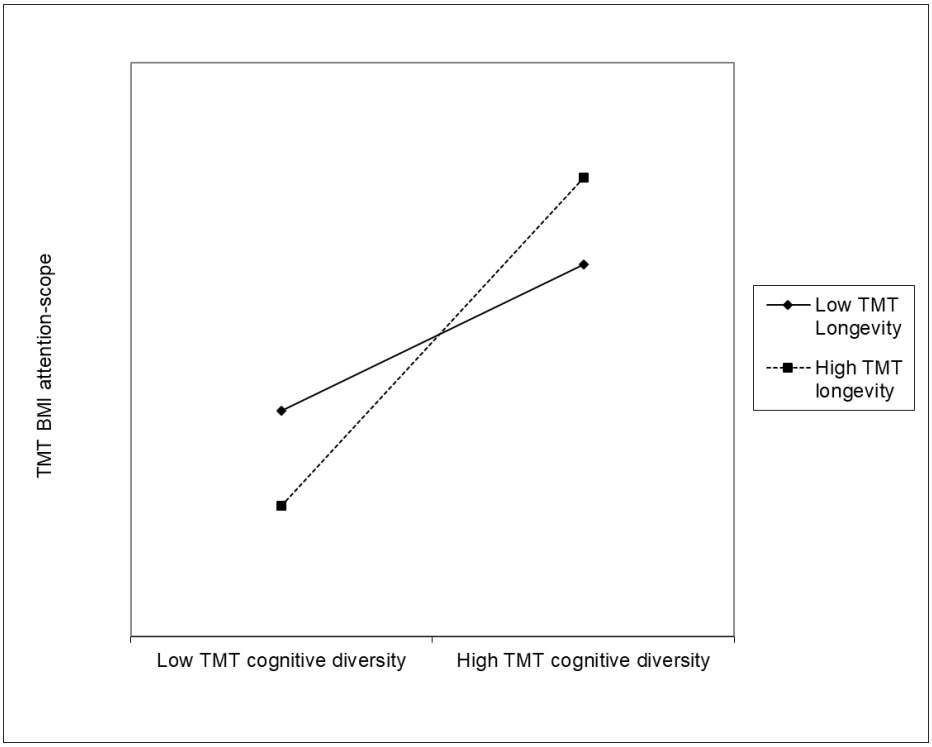


Figure II. Effect of TMT cognitive diversity and longevity on BMI intensity

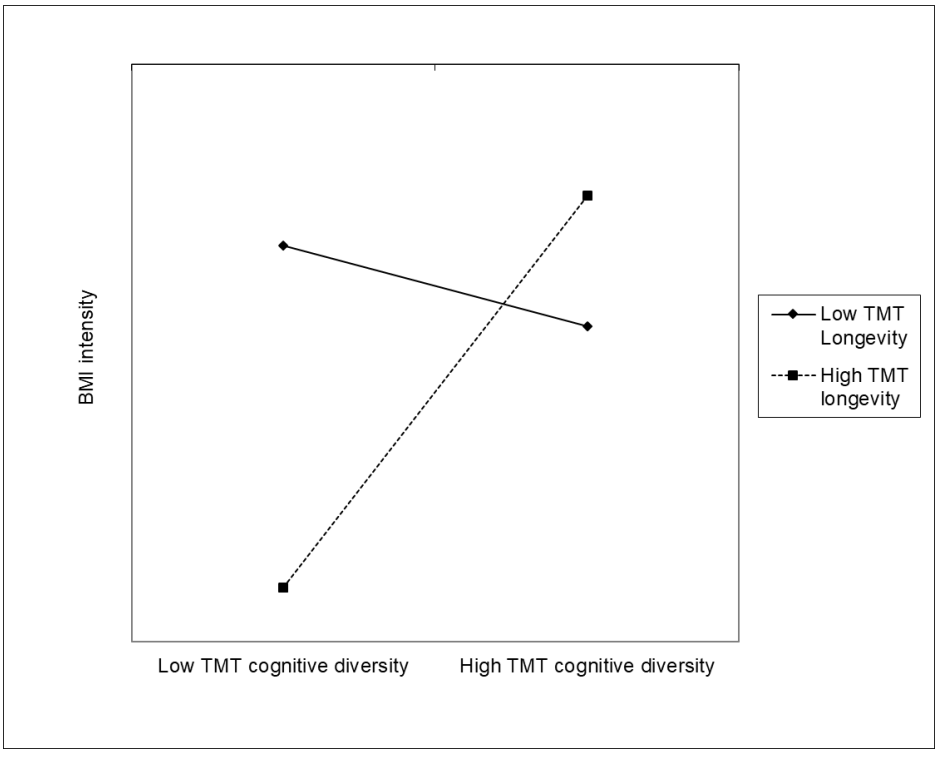
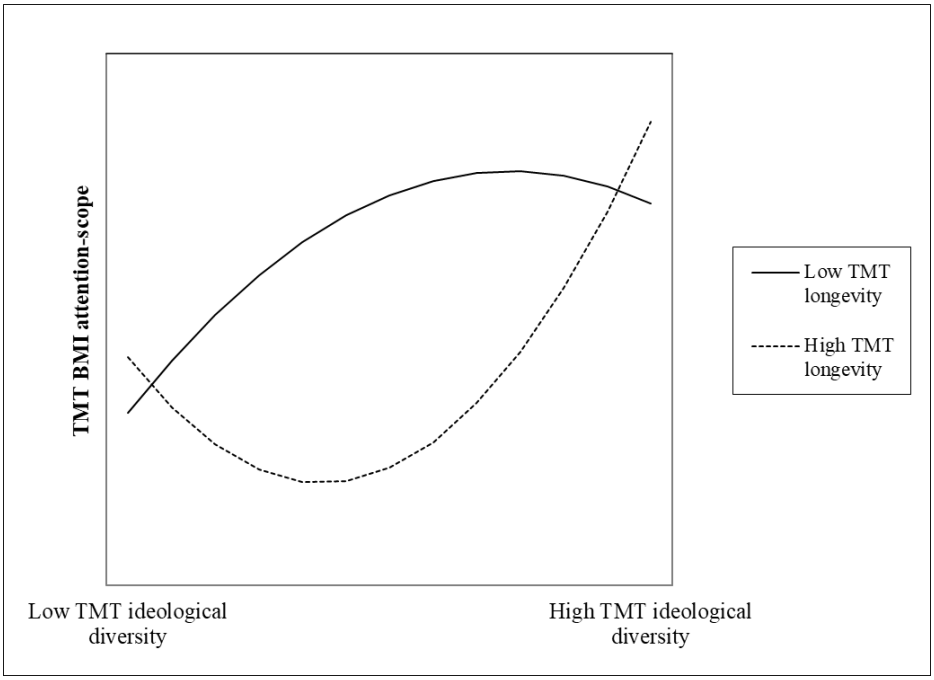


Figure III. Effect of TMT ideological diversity and longevity on BMI intensity



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