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# Exploring the Role of the Family CEO in Firm Innovation: A Capability-Based Perspective

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By

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Family firms are ubiquitous around the world. Family involvement in family businesses gives rise to unique features that not only make family firms behave distinctively from their nonfamily counterparts but also lead to great variations among such firms. From an innovation perspective, while family firms are regarded as conservative businesses that lack an innovation spirit in some studies, others recognize family firms as key economic drivers demonstrate entrepreneurial spirit.

This dissertation is an attempt to advance the understanding of family firm innovation heterogeneity by focusing on the role of family CEOs. In particular, this research explores what idiosyncratic resources and capabilities are generated from family management, specifically when a family member holds the CEO position. Employing a capability-based perspective of firm innovation, this research posits that the impact of a family CEO on firm innovation is two-fold. Family CEOs have a direct impact on firm innovation due to the distinctive resources possessed and the unique goals pursued. Family CEOs also have an indirect impact on firm innovation via the configuration and orchestration of other top management team (TMT) members' competencies, which

manifests as high-order, idiosyncratic managerial capabilities. Therefore, superior or inferior family firm innovation is the result of both TMT members' unique competencies acquired and developed by family firms as well as family CEOs' idiosyncratic managerial capabilities.

A randomly selected sample of 250 high-technology firms was used for the empirical tests. Findings suggest that family CEOs have a direct impact on firm innovation input and output and that family CEOs configure and orchestrate TMT resources distinctively compared to their professional counterparts. The results reveal theoretical implications for both family business and firm innovation and offer practical implications for leaders of family firms.

# DEDICATION

I dedicate this research to my family. My parents provide me unwavering love. My son is the reason for me to strive. No one in the world understands me better than my husband and supports me unconditionally like my husband; without him, I couldn't make this happen.

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# CHAPTER I

# INTRODUCTION

Innovation is critical to firm growth, profitability, and survival (Crossan & Apaydin, 2010; Damanpour, 1991; Kimberly, 1981). It is based on firms' abilities to identify innovation opportunities externally and to recombine resources internally to seize these opportunities, which primarily depends on top managers' competencies (Adner & Helfat, 2003; Helfat & Martin, 2015; Teece, 2007). Currently, organizational literature emphasizes the importance of the firm's adaptation to changing environments and highlights dynamic innovation as one critical source of competitive advantage (Helfat, Finkelstein, Mitchell, Peteraf, Singh, Teece, & Winter, 2009). Accordingly, the heterogeneity of firm innovation not only depends on a variety of sustainable unique and valuable resource endowments (Barney, 1991), as suggested by the resource-based view (RBV), but also relies on the firm's abilities to "change the product, the production process, the scale, or the customers (markets) served", namely, firm dynamic capabilities (Winter, 2003: 992). The firm's adaptation to changing environments by innovation primarily depends on the top management team's (TMT) competencies to sense and seize opportunities externally and to transform resources internally (Adner & Helfat, 2003). As a central strategic decision maker and integrator of disruptive change, the CEO sits at the strategic apex of the firm and possesses power and legitimacy to shape and facilitate strategies (Barker & Mueller, 2002; Kitchell, 1997; Yadav, Prabhu & Chandy, 2007).

The CEO also has a central role in configuring and orchestrating TMT managerial competencies (Kor & Mesko, 2013) because recruiting and promoting TMT members is within the CEO's responsibility (Hambrick, 1995). Employing a capability-based perspective, the firm's dynamic capabilities are largely influenced by the CEO, especially the way the CEO reconfigures the TMT members' externally-linked and internally-linked resources and orchestrates the resources to achieve effective integration (Kor & Mesko, 2013).

Family firms are ubiquitous around the world (Anderson & Reeb, 2003). Family involvement creates unique features in a firm, leading to distinctive behavior patterns in general and influencing firm innovation in particular (e.g., Chua, Chrisman, & Sharma, 1999; Duran, Kammerlander, van Essen, & Zellweger, 2015). The literature on family firm innovation usually employs an innovation input-output model, exploring the distinction between family firms and their nonfamily counterparts (De Massis, Frattini, & Lichtenthaler, 2013). While a negative relationship between family ownership and firm innovation input is dominant in prior studies (Block, 2012; Chen & Hsu, 2009; Chrisman & Patel, 2012; Gómez-Mejía, Campbell, Martin, Hoskisson, Makri, & Sirmon, 2014), mixed findings generally surface regarding the relationship between family involvement and firm innovation output (De Massis et al., 2013). Family business scholars predominantly draw on agency theory, attributing low levels of innovation input to the risk-aversion propensity arising from ownership concentration and to family owners' pursuit of noneconomic goals. These scholars further suggest that the superior innovation output observed in family firms is a result of effective family governance mechanisms (De Massis et al., 2013; Duran et al., 2015). Therefore, family firm innovation is

described as a paradoxical phenomenon: family owners are "unwilling yet able to innovate" and family firms can "do more with less" (Chrisman, Chua, De Massis, Frattini, & Wright, 2015; Duran et al., 2015). However, the existing research does little to further the understanding of the family firm's ability to innovate or to explain *when*, *how*, and *why* family firms are able to "do more with less". Recent family business research has recognized this limitation and calls for efforts to explore family firm innovation by employing the RBV (Carnes & Ireland, 2013).

To further this line of inquiry, this research suggests that family involvement in management (i.e., family CEO) is the key to understanding heterogeneous innovation capabilities associated with family firms. This research compares family CEOs with professional CEOs to explore *when*, *how*, and *why* family firms can "do more with less" in terms of firm innovation. In particular, this research posits that idiosyncratic resources and capabilities underlying family firm innovation manifest *when* a family member takes the CEO position (i.e., a family CEO). Drawing on a capability-based perspective of firm innovation, this research answers the *why* question by arguing that TMT members' externally-linked and internally-linked resources are among the determinants of the firm's capabilities to identify innovation opportunities and to pursue these opportunities through resource transformation and that the family CEO configures and orchestrates these TMT resources in a distinctive way. In addition, the *how* question is explored by addressing the idiosyncratic resource endowments and/or constraints that a family CEO creates and the superior and/or inferior managerial capabilities that a family CEO possesses. In so doing, this research shows that an agency perspective used to explain family firms' distinctive behavioral propensities with regard to firm innovation, as is

common in family firm studies, is restrictive to the understanding of the paradoxical effect of family firm innovation. This research attempts to mitigate this restriction.

In summary, this introduction details the literature gap this research seeks to fill—*when*, *why*, and *how* family firms can "do more with less" in terms of firm innovation—and discusses the utility in relation to the ongoing investigation of family firm innovation. In all, this study explores a CEO's role in firm innovation, particularly the way in which a family member acting as the CEO (i.e., a family CEO) has a distinctive impact on firm innovation. This investigation employs the RBV in general, and a capability-based perspective of firm innovation in particular, exploring the distinctiveness of family firm innovation that partly derives from family involvement in management. The remainder of this chapter is organized into seven sections: (1.1) definitions of key terms, (1.2) statement of the research problem, (1.3) significance of the study, (1.4) research approach, (1.5) limitations, (1.6) outline of subsequent chapters, and (1.7) chapter summary.

## 1.1 Definitions of Key Terms

To clarify the scope of this research, this section first highlights the research context, which is important in order to appropriately explore the impact of family CEO on innovation in high-technology firms. High-technology firms are usually defined by industry sectors; the following features are widely observed in these firms, including high demand for R&D, fast diffusion of technological innovations, and intense use of technical knowledge (Zakrzewska-Bielawska, 2010). Given innovation is one of the most critical factors leading to the success of these high-technology firms, setting the research

boundary within this scope helps to control the variations across industries and to identify idiosyncratic resources and capabilities underlying firm innovation.

To conceptualize the theoretical blocks of the research model, the following terms are defined and discussed in this section: (1.1.1) CEO type, (1.1.2) TMT managerial resources underlying firm innovation, (1.1.2.1) externally-linked TMT resources, (1.1.2.2) internally-linked TMT resources, (1.1.3) CEOs' managerial capabilities, (1.1.3.1) configuration of TMT resources, (1.1.3.2) orchestration of TMT resources, (1.1.4) firm innovation, (1.1.4.1) innovation input, and (1.1.4.2) innovation output.

### 1.1.1 CEO Type

Firms may be managed by family CEOs or professional CEOs. A family CEO is defined as a member of the controlling family who acts as the CEO of the firm. In contrast, a professional CEO is defined as a non-family member hired to act as the CEO of a family-owned firm or a nonfamily-owned firm (Anderson & Reeb, 2003; Naldi, Cennamo, Corbetta, & Gómez-Mejía, 2013). Family firms are defined as firms governed and/or managed by multiple family members at the same time or over the life of the firm (Chua et al., 1999; Miller, Le Breton-Miller, Lester, & Cannella, 2007). While the literature on family businesses widely agrees that firms managed by family CEOs are different in terms of behavior and performance (Anderson & Reeb, 2003; Miller, Minichilli, & Corbetta, 2013), there is no consensus regarding the impact of family CEO management. A number of studies find that a firm managed by a family CEO has superior performance (Anderson & Reeb, 2003; Villalonga & Amit, 2006) primarily due to the family CEO's substantial power to control (Gedajlovic & Carney, 2010; Jensen & Meckling, 1976), the creation of a stewardship atmosphere in the firm (Davis, Allen, &

Hayes, 2010), and the generation of firm-specific knowledge (Sirmon & Hitt, 2003). However, a negative effect of family CEOs on firm performance is also observed. This can be attributed to the family CEO's pursuit of family-related socioemotional wealth that may hurt firm performance (Gómez-Mejía, Haynes, Núñez-Nickel, Jacobson, & Moyano-Fuentes, 2007) and less competent family employment which is an outgrowth of the entrenchment of family management and nepotistic appointments (Morck, Shleifer, & Vishny, 1988; Schulze, Lubatkin, Dino, & Buchholtz, 2001). This research compares family-CEO-managed firms with professional-CEO-managed firms in terms of firm innovation and explores the role of the family CEO in firm innovation.

### 1.1.2 TMT Managerial Resources underlying Firm Innovation

Top managers (including the CEO and non-CEO TMT members) are identified as critical innovation drivers due to their substantial role in decision-making and resource allocation (Bantel & Jackson, 1989; Hambrick & Mason, 1984; Qiang, Maggitti, Smith, Tesluk, & Katila, 2013). Prior studies suggest that the experiences, skills, and cognitions of top managers reflect their beliefs and values, and, in turn, shape a firm's vision of innovation and help predict innovation strategies (Crossan & Apaydin, 2010). As top managers need to collaborate to formulate and implement strategies, the composition of their experiences, skills, and knowledge and their interactions provide a strong explanation for firm innovation (Bantel & Jackson, 1989; Crossan & Apaydin, 2010).

In high-velocity environments, top managers responsible for leading a firm in adapting to change have a salient role in organizational learning and firm innovation (Augier & Teece, 2009; Teece, 2012). TMTs need to identify new opportunities, explore possible solutions for newness creation (that is, innovation), and implement decisions and

innovation strategies (Bantel & Jackson, 1989). The substantial expertise and skills possessed by TMT members are fundamental in determining the speed of complex information processing and the search scope for newness. Thus, firm innovation primarily relies on top managers' discretion (Augier & Teece, 2009) and is largely determined by their capabilities in terms of identifying new opportunities and integrating new ideas and knowledge with the existing capabilities (Helfat & Raubitschek, 2000). Due to top managers' essential role in firm innovation, this research explores how the managerial resources associated with TMT members allow a firm to innovate and to revitalize. This research categorizes TMT members' managerial resources that underlie firm innovation into externally-linked TMT resources (1.1.2.1) and internally-linked TMT resources (1.1.2.2).

#### 1.1.2.1 Externally-Linked TMT Resources

Various formal and informal managerial social connections with other firms can bring in information and resources (Pfeffer & Salancik, 1978). Goodwill derived from external connections, known as bridging social capital, can be used to obtain valuable resources (Adler & Kwon, 2002; Nahapiet & Ghoshal, 1998) that are critical in sensing and seizing opportunities. From this perspective, externally-linked resources associated with TMT members tend to impact firm innovation input (Kor, 2006). For the purpose of this research, externally-linked TMT resources are measured as TMT members' prior organizational experiences and current external connections (e.g., the directorship in other firms).

#### 1.1.2.2 Internally-Linked TMT Resources

Internally-linked TMT resources consist of substantial knowledge, experience, skill, and education that TMT members have gained within the firm. These managerial resources have a role in facilitating knowledge sharing and enhancing cross-functional coordination (Eisenhardt & Martin, 2000; Simsek, 2007). For instance, while short-tenured managers can bring in new managerial insights that are beneficial to the newness creation, top managers with prolonged tenure usually have accumulated firm-specific tacit knowledge that allows them to make resource allocation decisions specific to the firm and to find possible solutions suitable to the firm (Kor & Mahoney, 2005). Thus, top managers with diverse tenure are critical to predict firm decisions on innovation (e.g., Bantel & Jackson, 1989). Further, top managers gain diverse firm-specific expertise after holding various managerial positions within the firm (Finkelstein, 1992; Damanpour & Schneider, 2006). The expanded network of the ties within the firm also helps these top managers shape a better understanding of routines across functional departments. For the purpose of this research, internally-linked TMT resources are measured as TMT members' firm tenure, team tenure, and intrafirm career variety. From this perspective, these resources tend to have an impact on innovation output (Damanpour & Schneider, 2006).

### 1.1.3 CEOs' Managerial Capabilities

The CEO of a firm is identified as a central strategic decision maker and an integrator of disruptive change who sits at the strategic apex of a firm (Barker & Mueller, 2002; Kitchell, 1997; Yadav et al., 2007). In high-velocity environments, the CEO of a firm is the most powerful and influential leader among the TMT members, having the

authority and responsibility to lead the firm in adapting to changing environments (Adner & Helfat, 2003). Compared with other TMT members, the CEO influences strategic change in general, and firm innovation in particular, due to the CEO's managerial function of configuring and orchestrating TMT competencies (Kor & Mesko, 2013). In an attempt to investigate the family CEO's impact on innovation, this research posits that, while the family CEO has a direct impact and an indirect impact on firm innovation, the indirect impact is manifested as the distinctive way in which the family CEO configures and orchestrates TMT resources, indicating the family CEO's distinctive managerial capabilities.

#### 1.1.3.1 Configuration of TMT Resources

The configuration of TMT resources describes the process through which the CEO shapes the composition of TMT competencies (Kor & Mesko, 2013). Prior literature suggests that the CEO of a firm is considered the architect of the TMT and has the power and authority to influence TMT composition and TMT diversity (Cannella & Holcomb, 2005; Finkelstein, 1992). This managerial function of a CEO is manifested when the CEO identifies, recruits, promotes, and recombines the managerial skills and expertise of TMT members (Kor & Mesko, 2013; Shen & Cannella, 2002).

TMT resource configurations in family-CEO-managed firms are different from those in professional-CEO-managed firms. For example, in a family-CEO-managed firm, the unique goals pursued by the family CEO, such as maintaining family control and transgenerational succession, influence TMT recruitment and promotion (Chrisman, Chua, Pearson, & Barnett, 2012; Gómez-Mejía, Cruz, Berrone, & De Castro, 2011). The divergent interests between the family CEO and nonfamily TMT members, as well as the

limited career potential of nonfamily TMT members (Chrisman, Memili, & Misra, 2014), result in the recruitment of less competent TMT members and lead to restricted externally-linked TMT resources. In addition, in a family-CEO-managed firm, TMT members tend to develop superior internally-linked resources during their terms, such as high levels of intrafirm career variety and tenure diversity, primarily due to the family CEO's managerial discretion and firm-specific knowledge (Le Breton-Miller & Miller, 2006). For the purpose of this research, the role of the family CEO in the configuration of TMT resources is examined as the mediation effect of TMT resources on the family CEO and firm innovation relationship.

#### 1.1.3.2 Orchestration of TMT Resources

The orchestration of TMT resources describes the process through which the CEO, acting like an orchestra conductor, elicits harmonious performances from TMT members and integrates specialized knowledge to achieve better group-level performance (Kor & Mesko, 2013). Prior literature suggests that the CEO's firm-specific knowledge and managerial discretion are critical to enhancing coordination and nurturing synergies (Hernandez, 2012). This managerial function of the CEO can be facilitated effectively when the CEO provides a clear firm vision, nurtures an innovation culture, and enhances resource coordination (Sirmon, Hitt, Ireland, & Gilbert, 2011).

In a family-CEO-managed firm, the orchestration of TMT resources is unique due to the family CEO's salient managerial discretion (Carney, 2005; Le Breton-Miller & Miller, 2006), the firm-specific knowledge generated through family education (Sirmon & Hitt, 2003), and the use of generalized exchange systems to govern TMT interactions (Ensley & Pearson, 2005; Long & Mathews, 2011). For the purpose of this research, the

role of the family CEO in orchestrating TMT resources is examined as the moderating effect of family CEO on the TMT resources and firm innovation relationship.

### 1.1.4 Firm Innovation

Innovation has been the focus of intense research due to its great impact on both economic growth and firm performance (Crossan & Apaydin, 2010; Damanpour, 1991; Kimberly, 1981). In organizational studies, innovation is regarded as a critical tool of a firm to exploit opportunities by providing newness (e.g., improved products, services, and production processes; Drucker, 1985). Firm innovation carries many meanings in prior studies. It denotes (a) a set of activities through which a firm identifies new opportunities and generates, accepts, and implements new ideas (Thompson, 1965); (b) a variety of outputs, taking the form of new products, processes, or services (Kimberly, 1981); and (c) an attribute of an organization that reflects a firm's willingness or ability to innovate (that is to say, innovativeness). This research takes this multi-faceted perspective, emphasizing the underlying role of resources and capabilities relating to firm innovation. A firm relies on a variety of resource inputs and conducts distinctive innovation activities in an integrated way through which innovation capabilities are developed and newness is generated, accepted, and implemented.

Successful innovation contributes to firm competence. However, in high-velocity environments, a firm needs to innovate to achieve a better fit between the firm and the environment. Innovation, reflecting a firm's capacity to learn (Auh & Menguc, 2005), is a critical source of the firm's capability to maintain competitiveness (Helfat et al., 2009). In an attempt to employ this dynamic perspective of innovation, this research conceptualizes firm innovation as both innovation input (1.1.4.1) and innovation output

(1.1.4.2), and explores firm innovation as an outcome of the firm's dynamic managerial capabilities.

#### 1.1.4.1 Innovation Input

Innovation input is defined as an activity used to exploit innovation opportunities and linked to offering the newness such as new products, services, and production processes (De Massis et al., 2013). Research and development (R&D) investment—comprising critical activities in terms of developing new knowledge and turning it into new products, services, and processes (Chiesa, 2001)—is widely used as the measure of innovation input in firm innovation literature (Fritsch & Franke, 2004; Tang, 2006). In this research, innovation input is measured as R&D investment in the firm.

#### 1.1.4.2 Innovation Output

Innovation output describes the outcome resulting from innovation input (Crossan & Apaydin, 2010). Innovation requires more than R&D investment; it also includes the adoption of best practices and the delivery of superior products and services and requires the implementation of complementary organizational activities and cross-functional managerial coordination (Teece, 2007). During this process, resources and assets are recombined and orchestrated in the firm, while firm-specific routines and procedures are reframed and redeveloped (O'Reilly & Tushman, 2008). In this research, innovation output is measured as total sales (Block, 2012).

## 1.2 Statement of Research Problem

The main research objective of this research is to further the current understanding of family firm innovation. Prior family business studies identify a

paradoxical effect in family firm innovation—"doing more with less"—and attribute this effect to family governance, through which idiosyncratic resources and capabilities are generated and unique goals are pursued (Chrisman et al., 2015; Duran et al., 2015). This research posits that family firms are heterogeneous concerning firm innovation and that the heterogeneity derives from various forms of family involvement in the business, such as family ownership and family management. In addition, family management, especially a family member holding the CEO position, allows one to understand the idiosyncratic resources and capabilities that underlie firm innovation in rapidly changing environments. Therefore, this research employs the RBV in general, and a capability-based perspective of innovation in particular, to explore idiosyncratic resources and capabilities deriving from family management (i.e., family CEO). This research posits that the way in which family CEOs influence firm innovation is different from professional CEOs; the difference is based upon the unique goals, idiosyncratic resources, and capabilities of family CEOs. The research questions of this study are as follows:

*Research Question 1: Why does a family CEO have a distinctive impact on firm innovation?*

In pursuit of the answer to this research question, this research (a) reviews family business literature and (b) presents a capability-based perspective of firm innovation. The goal of the review is to explore what unique goals and idiosyncratic resources arise from family management (i.e., family CEO) and underpin firm innovation. The presentation of a capability-based perspective of firm innovation aims to provide a justification of w*hy* these idiosyncratic resources generated through family involvement (i.e., family CEO)

influence firm innovation. The literature review serves as the foundation for the following research questions.

*Research Question 2: Compared to a professional CEO, how does a family CEO have a distinctive direct impact on firm innovation?*

In pursuit of the answer to this research question, this research draws on family business literature, exploring the firm-level outcome (i.e., firm innovation) of the presence of family CEOs. Family business studies have observed that family involvement in a business takes various forms (Chua et al., 1999). When a family member holds the CEO position, unique goals and idiosyncratic resources are generated in these firms, which contributes to the understanding of heterogeneous family firm innovation. The exploration of the family CEO's direct impact on firm innovation is essential to understanding the heterogeneity of family firm innovation.

*Research Question 3: Compared to a professional CEO, how does a family CEO have a distinctive indirect impact on firm innovation?*

In pursuit of the answer to this research question, this study draws on a capability-based perspective of firm innovation to explore the family CEO's indirect impact on firm innovation that is primarily facilitated by their managerial capabilities in terms of the configuration and orchestration of TMT resources. TMT member recruitment, promotion, and resource recombination are within a CEO's managerial discretion (Kor & Mesko, 2013). The presence of a family CEO in the firm not only has a firm-level impact in terms of innovation but also influences interactions within the TMT. While TMT resources are among the critical predictors of firm innovation, the exploration of (a) the mediation effect of TMT resources on the family CEO and firm innovation relationship

and (b) the moderation effect of the family CEO on the TMT resource and firm innovation relationship can advance the understanding of unique capabilities associated with the family CEO.

## 1.3 Significance of the Study

This research explores the distinctive role of the family CEO in firm innovation. In particular, this research expands on current approaches to the study of family business by examining *when* distinctive resources and capabilities underlying firm innovation are generated and *why* and *how* these resources and capabilities impact firm innovation. Specifically, this study employs the RBV approach in general, and a capability-based perspective in particular, and contends that the family CEO's distinctive role in innovation is twofold: (a) a direct impact on firm innovation due to the unique goals and the idiosyncratic resources generated by family management and (b) an indirect impact on firm innovation through the CEO's managerial capabilities on TMT resource configuration and orchestration. In so doing, this research contributes to family business literature by extending the analytic perspective from an agency perspective to a capability-based perspective and by exploring the TMT members' resource endowments (constraints) and the CEO's capabilities (higher-order capabilities) generated through family management (i.e., family CEO).

This research also expands current approaches to the study of innovation by employing a capability-based view and emphasizing top managers' salient role in family firm innovation. According to such a capability-based view, a firm's competitive advantage of innovation primarily lies in the firm's dynamic and higher-order capabilities (Leiblein, 2011), which reflect the firm's capacity for change and the dominant

coalition's vision of how to adapt to rapidly changing markets through its internal renewal (i.e., innovation). While dynamic capabilities, as a firm-level construct, are critical to firm growth and survival in high-velocity environments, idiosyncratic dynamic managerial capabilities associated with top managers can predict more variations in firm innovation. Therefore, firm innovativeness is more of an intrinsic characteristic of the owners and/or managers than of the company (Verhees & Meulenberg, 2004). Managerial resources not only reflect the owners and/or managers' values, cognitions, and perspectives on innovation, as upper echelons theory suggests (Hambrick & Mason, 1984), but also indicate top managers' capabilities of opportunity sensing, seizing, and resource transformation. This research advances the understanding of firm innovation by utilizing the capability-based view within the context of family firms and by highlighting the role of top managers' managerial resources in this process.

The literature on family businesses reveals a paradoxical phenomenon in relation to family firm innovation: family firms have superior ability but are less willing to engage in innovation (De Massis, Frattini, Pizzurno, & Cassia, 2015; Duran et al., 2015). However, heterogeneity exists widely in family firms in terms of both willingness and ability (Chua, Chrisman, Steier, & Rau, 2012; Gedajlovic, Carney, Chrisman, & Kellermanns, 2012). While a great number of studies predominantly draw on governance literature and agency theory to explore the way in which various types and degrees of family involvement (e.g., family ownership and family management) give rise to distinctive goals that a firm is willing to pursue (Chrisman, Sharma, Steier, & Chua, 2013; Miller, Le Breton-Miller, Minichilli, Corbetta, & Pittino, 2014), few studies investigate the variety of resources and capabilities generated by family involvement.

Without integrating the ability perspective into the explanation of family firm innovation, the literature on family businesses may result in a paradoxical understanding of family firm innovation: family firms' unwillingness to invest in R&D exists even for those in high-technology industries where R&D investment is of the greatest importance (Gómez-Mejía et al., 2014). This research posits that family firms are heterogeneous in terms of innovation capability; instead of an unwillingness to innovate, a family firm with resource constraints and inferior managerial capabilities is unable to sense and seize innovation opportunities. In so doing, this research responds to calls for further efforts to advance knowledge about family firm heterogeneity (Chua et al., 2012) and helps to form an integrated picture of family firm innovation (Duran et al., 2015) by addressing both the willingness and the ability of a family firm to innovate.

This research has practical implications for both family and nonfamily firms. First, it suggests that TMT competencies have various dimensions that may affect firm innovation input and output differently. While TMT members with more externally-linked resources are critical for high-technology firms aiming to enhance their R&D status in the industry, TMT members with salient internally-linked resources are valuable for high-technology firms whose goal is to improve the conversion from R&D investments into firm sales. Second, this research posits that the CEO influences TMT competencies during two stages: the TMT member recruitment stage and the TMT member retention stage. Studies of family businesses suggest that the presence of the family CEO in a family firm may negatively influence TMT recruitment and result in less talented top managers being hired by the firm, whereas the family CEO can enhance these TMT members' competencies during their tenure by creating more internally-linked

resources for the TMT members. As such, even though less likely to hire high profile top managers, a family CEO-managed firm can nurture a management cadre internally and eventually build competent professional executive teams through TMT resource configuration and orchestration.

## 1.4 Research Approach

The primary empirical goal of this research is to examine how the family CEO has an impact on firm innovation both directly and indirectly. There are several challenges in achieving this goal, but the research approach of this study is designed to solve these challenges.

First, measures of externally-linked TMT resources (i.e., prior organizational experiences and current external connections) and internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety) are proxies of TMT managerial competencies (Barker & Mueller, 2002; Gwynne, 2003). These measures are better fitted to the RBV approach and reflect the firm's resource endowments (constraints) associated with top managers. In addition to examining the direct effect of the family CEO on firm innovation, this research employs a capability-based perspective of firm innovation to examine the mediation effect of TMT resources and the moderating effect of the family CEO, which reflects the CEO's managerial capabilities denoted as TMT resource reconfigurations and orchestrations. Details are discussed further in Chapter III.

Second, firm innovation varies greatly across industrial sections. This research draws its sample from publicly traded firms in high-technology industries that are listed on the U.S. stock market with Standard Industrial Classification (SIC) codes such as 357, 365, 366, 367, 381, 382, 384, and 386. The definition of a high-technology industry

comes from the AeA, the largest association of high-tech companies in the United States, and the sample has been used in prior studies on firm innovation (e.g., Gómez-Mejía et al., 2014; Li, Eden, Hitt, & Ireland, 2008). Firms in these industries are ideal for research on firm innovation as the survival and profitability of these firms are critically dependent on their ability to create and commercialize innovations quickly and efficiently. A family firm is identified as in prior literature on family business. When a family owns 5% or more of a firm's stock and at least one family member (a person related by blood or marriage to the owning family) is on the TMT or the board of directors, that firm is defined as a family firm (e.g., Anderson & Reeb, 2003; Jones, Makri, & Gómez-Mejía, 2008).

Third, the hypothesized relationships are tested using regression modeling. All the models are tested using two samples: (1) high-technology firms that include both family and nonfamily firms and (2) family firms identified by using the above-mentioned criteria. The measure of all the variables, including independent, dependent, mediator, moderator, and control variables, are collected from the Compustat database, firm annual reports (10-K), proxy statements (DEF 14), and other databases. Details are discussed further in Chapter IV.

## 1.5 Limitations

This research is bound by several limitations, which offer opportunities for future research. First, this research distinguishes the family CEO, a critical component of family involvement, from other types of family involvement (e.g., family ownership and family involvement in TMT) and measures the family CEO as a binary variable. However, family CEOs may be heterogeneous as well. Family-related features associated with

family CEOs (e.g., founder family CEOs or later generation family CEOs) may cause variations across firms with regard to innovation input and output.

Second, this research draws on the study of dynamic capabilities to apply a capability-based view of innovation within the context of family firms. By following prior literature (Crossan & Apaydin, 2010; Helfat & Martin, 2015), this study examines top managers' externally-linked resources (i.e., prior organizational experiences and external connections) and internally-linked resources (i.e., firm tenure, team tenure, and intrafirm career variety) as proxies of managerial resources that underlie firm innovation. However, using different types of proxies leads to various outcomes. The value of using the current measures of TMT resources is fully discussed in Chapter III.

This research uses firms in narrow industry sections (with SIC codes such as 357, 365, 366, 367, 381, 382, 384, and 386) to answer the research questions. While this sampling design can enhance the reliability of the study, it has limitations due to the assumption that firm innovation patterns found in these industry sections can be generalized to others. Further considerations and discussions will be presented in Chapter IV and Chapter V.

## 1.6 Outline of the Study

This research explores the family CEO's distinctive roles in firm innovation. In particular, this research contends that in rapidly changing environments, the firm's competitive advantage in terms of innovation arises from its adaptation to emerging products and market changes, which is based on top managers' resources and dynamic managerial capabilities (Adner & Helfat, 2003; Helfat & Martin, 2015). In accordance with this capability-based perspective of innovation, the impact of the CEO on firm

innovation is both direct and indirect; the indirect effect draws upon the CEO's configuration and orchestration of TMT resources. Therefore, the role of the family CEO in firm innovation is influenced not only by unique goals and idiosyncratic resources derived from family management but also by the distinctive way in which the family CEO configures and orchestrates TMT resources. This research addresses these issues in the following chapters.

Chapter II reviews the existing literature on family firm innovation and presents a capability-based perspective of firm innovation. While each component topic of inquiry provides insights into the exploration of innovation in family firms, the overlap in the study is the most relevant to this research and is also arguably the least developed as a field of study. Building from the review presented in Chapter II, Chapter III develops hypotheses concerning the family CEO's distinctive impact on firm innovation. To accomplish this goal, Chapter III details the relationships among constructs. Chapter IV describes the sampling approach and the measures, proceeds with data analytics and reports the results of the analysis. Chapter V concludes the research with a discussion of the results and provides an overall assessment regarding the appropriateness and the contributions of this research, as well as future research opportunities.

## 1.7 Chapter Summary

Chapter I reviews a paradoxical effect of family firm innovation, that is, unwilling, yet able to innovate" and "doing more with less". The chapter then posits that family firms are heterogeneous in terms of innovation capability. Further, exploration is presented of *when* heterogeneous resources and capabilities are generated in family firms and *why* and *how* these resources and capabilities influence firm innovation. This chapter

provides definitions of key terms, the research question to be answered, the research approach this study takes, the significance and limitations, and an outline of the following four chapters.

# CHAPTER II

# LITERATURE REVIEW

The purpose of this chapter is to provide a review of family firm and capability-based literature related to firm innovation. First, this chapter provides a review of family firm innovation, especially family involvement and its consequences for firm innovation. Next, a synthesized perspective of capability-based firm innovation is presented. In particular, this research draws on the RBV in general, and employs dynamic capability literature in particular, to explore managerial resources critical to firm innovation. The goal of this chapter is to provide a theoretical foundation that will support the investigation of the role of the family CEO in firm innovation within dynamic environments that are to be detailed in Chapter III.

## 2.1 Family Firm Innovation: A Literature Review

Family firms are ubiquitous around the world. A significant presence of family firms is observed in both publicly traded companies and medium-small sized private firms (Anderson & Reeb, 2003; Carney, Van Essen, Gedajlovic, & Heugens, 2015; La Porta, Lopez-de-Silanes, & Shleifer, 1999). Family firms account for approximately one-third of the most competent companies, such as *S&P 500* and *Fortune 1000* companies (Anderson & Reeb, 2003; Miller et al., 2007), and as much as 90% of all businesses in the US (Anderson & Reeb, 2004). While ubiquitous, family firms are heterogeneous in nature (Chua et al., 2012). For example, family firms are characterized as conservative

businesses that lack an innovative spirit and prefer the status quo (La Porta et al., 1999), and family firms are also seen as key economic drivers filled with entrepreneurial spirit (Morck & Yeung, 2003). The heterogeneous nature of family firms has provoked increasing research attention in recent decades (Gedajlovic et al., 2012; Gómez-Mejía et al., 2007). Concerning empirical findings, prior studies continue to yield mixed results (Chrisman & Patel, 2012; De Massis et al., 2013; Duran et al., 2015), suggesting that further work is needed to explore the factors that influence family firm innovation. This chapter reviews family firm innovation literature in an attempt to provide a synthesized summary and shed new light on family firm innovation.

The first section of this review describes the heterogeneity of family involvement. Following it, this research employs an effort–ability framework widely used in family business studies (Gedajlovic et al., 2012) to explore the heterogeneity of family firm innovation. In particular, the second section addresses family firms' unique intentions that affect firm innovation, while the third section focuses on family firms' idiosyncratic abilities to engage in firm innovation. Finally, a summary of the research gap is presented, shedding light on a possible solution to explain the paradoxical phenomenon of family firm innovation. In brief, this review is organized into the following parts: (2.1.1) the heterogeneity of family involvement, (2.1.2) family firms' unique intentions on firm innovation, (2.1.3) family firms' idiosyncratic innovation abilities, and (2.1.4) a summary of the research gap.

### 2.1.1 The Heterogeneity of Family Involvement

A critical question remains in family business studies concerning the effects of family involvement on family firms. Family involvement in a business takes various

forms and may uniquely influence firm behavior and performance (Chua et al., 1999, 2012; Gedajlovic et al., 2012). While family involvement can be observed as family ownership and/or family management, the true essence of family involvement is reflected in the unique goals and idiosyncratic resources that result from family presence (Chrisman et al., 2012; Habbershon, Williams, & MacMillan, 2003).

*Family involvement observed in firm governance.* Family involvement in a business can be perceived as the extent to which ownership and control are unified within a family (Jensen & Meckling, 1976). From this perspective, family involvement varies broadly in terms of the level of family ownership and family member participation in management. Family ownership and family management provide the family the power and legitimacy necessary to pursue the family's vision of the firm by influencing the formation of the firm goals (Chrisman et al., 2012; Chua et al., 2012; Mitchell, Agle, & Wood, 1997). Perceiving a firm goal as the outcome of interactions within the firm coalition (Cyert & March, 1963), a high level of family involvement in ownership and management exerts a significant influence on the goal negotiation processes (Chrisman et al., 2013; Kotlar & De Massis, 2013), thus leading to the adoption of the family's goal as that of the firm. However, family involvement in governance varies greatly across firms (Chrisman et al., 2012). When a family completely owns and manages a firm, the family has absolute voting rights and possesses full control over the firm. Such authority and autonomy does not exist in a firm in which both family and nonfamily members simultaneously hold ownership and leadership roles. Therefore, family involvement in firm governance can reflect the extent to which the family's vision of the business shapes

firm behavior due to the negotiation power associated with family members involved in the firm (Chua et al., 2012).

Aligned with this notion, a family CEO is an important component of family involvement and can provide great research valence in the study of family firm innovation (Duran et al., 2015). As a central strategic decision maker sitting at the strategic apex of a firm, the CEO possesses the power and legitimacy to shape and facilitate innovation strategies (Barker & Mueller, 2002; Crossan & Apaydin, 2010; Kitchell, 1997; Yadav et al., 2007). When a family member acts as a CEO of the firm, the family CEO has greater power and legitimacy that are derived from family ownership (Miller et al., 2013). Thus, a family CEO, through whom the family owners' investment intention is mirrored (Duran et al., 2015), will influence the way the firm revitalizes itself.

*Family involvement and goals pursued.* Family involvement in ownership and management can be easily observed; however, it is the essence of family business that distinguishes family firms from nonfamily firms (Chua et al., 1999). The essence of family business is manifested as the controlling family's vision of the business and the distinctive behavior shaped by that vision (Chrisman, Chua, & Sharma, 2005; Chua et al., 1999). A family's vision of the business emerges when the family regards the business as a vehicle to achieve the desired future of the family (Chua et al., 1999). Under the guidance of such vision, the goals adopted by the firm convey unique emotional values and affective endowments that are not requisite for economic benefits (Gómez-Mejía et al., 2007; Gómez-Mejía et al., 2011). Vision and goals vary across all firms, not only family firms. However, the variation in family firms is greater than that in nonfamily

firms because of the pursuit of noneconomic goals in the former (Chrisman et al., 2012, 2013). The idiosyncratic vision and goals in family firms reflect the controlling family's unique intentions, as well as the family owner-managers' personal goals of achieving wealth, power, status, and job security, which give rise to affective endowments denoted as socioemotional wealth (Gómez-Mejía et al., 2007, 2011). The pursuit of such goals may lead to unique firm behaviors, such as time-horizon and risk preference (Chrisman et al., 2012; Gómez-Mejía et al., 2011; Le Breton-Miller & Miller, 2006). Accordingly, the heterogeneity of such goals can explain the greater variation of firm behavior observed in family firms, including preferences toward R&D investments in family firms (Chrisman & Patel, 2012).

While a family's vision of the business is less observable, specific types of family involvement may indicate the family's distinctive intentions for the business. For example, a family's pursuit of sustainable control of the firm across generations is among the central goals of many family firms (Chua et al., 1999). Such transgenerational succession intention may influence the firm's critical strategic decisions (Berrone, Cruz, & Gómez-Mejía, 2012), such as those about family firm initial public offerings (IPOs) (Zellweger, Kellermanns, Chrisman, & Chua, 2012). Accordingly, multi-generational involvement in a firm may influence the firm's strategic decisions on innovation (Chrisman & Patel, 2012), thus providing valuable research insights for the study of family businesses.

*Family involvement and familiness resources.* The extent of family involvement drives the family's embeddedness in the firm; the family and the business are intricately intertwined (Aldrich & Cliff, 2003). Family firms act as an inseparable unified system of

the firm, the family, and the individuals, which creates synergies (Habbershon et al., 2003). The interactions between the family and the business may facilitate the development of "familiness"—deeply embedded resources and capabilities within the firm (Habbershon & Williams, 1999; Habbershon et al., 2003). Familiness as a bundle of unique, inseparable, and synergistic resources and capabilities takes various forms, including patient financial capital, idiosyncratic firm-specific human capital, strong social capital (Pearson, Carr, & Shaw, 2008; Sirmon & Hitt, 2003), and identification and stewardship ( Davis et al., 2010; Zellweger, Eddleston, & Kellermanns , 2010).

Familiness has inconsistent effects on family firms, and may be a source of competitive advantage or disadvantage in comparison to nonfamily firms (Habbershon & Williams, 1999; Habbershon et al., 2003). Concerning firm innovation, the distinctiveness of family involvement may manifest in forms such as (a) patient financial capital due to the family's long-term orientation associated with family involvement (Sirmon & Hitt, 2003), (b) firm-specific human capital available through family members that are beneficial to resource evaluation and enriching activities (Carnes & Ireland, 2013), and (c) strong social capital that brings in resources and facilitates intra-firm communications (Marett, Marett, & Litchfield, 2015; Pearson et al., 2008). In contrast, family involvement, with its unique feature of the closure of the family firm's elite network, excludes nonfamily members (Sirmon & Hitt, 2003), thus hindering idea generation and demotivating nonfamily members (Carnes & Ireland, 2013).

Familiness is less observable as well; researchers suggest that familiness is particularly associated with family involvement in top executive positions (Minichilli, Corbetta, & MacMillan, 2010). For instance, a family CEO is regarded as a source of

distinctive familiness due to their managerial discretion (Minichilli et al., 2010) and role in creating a stewardship atmosphere within the firm (Davis et al., 2010). A later-generation CEO may receive strategic education during childhood, which helps to cultivate idiosyncratic firm-specific knowledge denoted as distinctive familiness (Sirmon & Hitt, 2003). However, family involvement in the TMT may create faultlines between family managers and nonfamily managers (Minichilli et al., 2010), resulting in constrictive familiness (Habbershon et al., 2003) that is detrimental to firm performance.

To summarize, family firms are not homogeneous; the heterogeneity of family firms may develop through family involvement in these firms. Family involvement gives rise to variation in (1) the combinations of family ownership and management, (2) the goals pursued by the family, and (3) the idiosyncratic resources and capabilities. While family ownership and family management are common operational measures of family involvement, the unique goals and idiosyncratic resources—manifested as the distinctive efforts and abilities associated with family firms—are essential to advance the understanding of family firms' pursuit of strategic behavior (Daspit, Chrisman, Sharma, Pearson, & Long, 2017). Next, this research employs an effort–ability framework (Gedajlovic et al., 2012) to explore family firm innovation. The following sections review family firm innovation literature, highlighting unique intentions that arise from family involvement and idiosyncratic abilities that are created through family involvement.

### 2.1.2 Family Firms' Unique Intentions Regarding Firm Innovation

A great number of family firm innovation studies primarily draw on agency theory and behavioral agency theory, predicting that family involvement gives rise to

distinctive agency concerns and leads to unique intentions concerning firm innovation. These studies predominantly explore the distinction between family firms and nonfamily firms rather than the heterogeneity among family firms. Family involvement is usually operationalized as a binary variable (e.g., Gómez-Mejía et al., 2014; Muñoz-Bullón & Sanchez-Bueno, 2011; Patel & Chrisman, 2014), which assumes that family firms are homogeneous. In several studies, family involvement is measured as a continuous variable of family ownership (e.g., Block 2012; Chen & Hsu, 2009; Chrisman & Patel, 2012). A negative relationship between family involvement (e.g., family ownership) and R&D investment dominates these empirical findings (De Massis et al., 2013; Duran et al., 2015).

According to agency theory, the unification of ownership and control in family firms gives rise to unique behavioral propensities (Carney, 2005) and distinctive agency concerns (Jensen & Meckling, 1976). While family governance can mitigate traditional agency problems (i.e., the agent's opportunistic behavior) to some extent (Chrisman, Chua, & Litz, 2004; Jensen & Meckling, 1976), some agency problems arise specifically in family firms. For example, the controlling family may engage in self-interested behaviors through the firm (Schulze, Lubatkin, & Dino, 2003; Gómez-Mejía et al., 2007). Concerning firm innovation, high levels of ownership concentration in a single family may lead to risk aversion concerning firm innovation; accordingly, family firms tend to invest less in R&D (Block, 2012; Duran et al., 2015). This agency problem may be exacerbated when the controlling family lacks the self-control and possesses asymmetric altruism toward family members (Schulze et al., 2001, 2003).

Behavioral agency theory suggests that firms may actually be loss-averse rather than risk-averse, and that family firms frame critical decisions around gains and losses with socioemotional wealth as the reference point in the loss-gain evaluation when making critical decisions (Chrisman & Patel, 2012; Gómez-Mejía et al. 2007; Wiseman & Gómez-Mejía, 1998). Because firm innovation requires substantial investment (Grossman & Helpman, 1993) and intense knowledge resources, the successful pursuit of innovation may result in nonfamily members' involvement in financial arrangements or firm management and thus the sacrifice of family control (Gómez-Mejía et al., 2014). Family-centric noneconomic goals, such as maintaining the family's control in the business, discourage family firms from using external financial capital or hiring nonfamily managers, which may enhance the firm's innovation capabilities and long-term wealth (Gómez-Mejía et al., 2007, 2011). As a result, family firms tend to invest less in innovation than do their nonfamily counterparts (Chrisman & Patel, 2012; Chen & Hsu, 2009). This trend is also observed in high-technology firms, where insufficient innovation represents a risk to firm survival (Gómez-Mejía et al., 2014).

In studies within this research stream, few efforts have been made to distinguish various types of family involvement, including family management and multi-generational involvement (e.g., Block, 2012; Chrisman & Patel, 2012). According to agency theory and behavioral agency theory, principal–principal agency problems arise and are exacerbated within family management in these firms, leading to family owner-managers' expropriation of other owners' economic benefits (Singla, Veliyath, & George, 2014; Young, Peng, Ahlstrom, Bruton, & Jiang, 2008). These behavioral propensities are salient particularly when family members hold executive positions, such

as the chairman of the board and/or the CEO position. Drawing on these arguments, a family-owned and managed firm tends to invest less in R&D than a firm that is family-owned but not family-managed due to the family owner-manager's risk-averse propensity and the desire to pursue non-economic goals (e.g., the reluctance to cede control to nonfamily members) (Duran et al., 2015). In addition, multi-generational involvement may give rise to a wide range of goals family members aim to pursue through their firms. Various goals can strengthen (or weaken) the family owners' unwillingness to innovate, resulting in a wide variation among family firms concerning firm innovation (Chrisman & Patel, 2012).

To summarize, a number of studies on family firm innovation employ agency theory or behavioral agency theory, usually measure family involvement as a dichotomous or continuous variable of family ownership, and report a negative association between family involvement and firm R&D investment (Block, 2012; Chen & Hsu, 2009; Chrisman & Patel, 2012; Gómez-Mejía et al., 2014). Family business researchers explain this finding as family owners being able but unwilling to innovate, creating a paradox of family firm innovation (Chrisman et al., 2015; Duran et al., 2015).

However, according to family business literature, a family firm's distinctive behavioral propensity can be caused by both its unique efforts and idiosyncratic abilities (Gedajlovic et al., 2012). As a critical driver of firm growth, profitability, and survival, innovation is determined not only by a firm's (un)willingness to innovate but also its (in)ability to innovate. Therefore, a negative relationship between family ownership and firm innovation may reflect the effect of family owners' unique intentions regarding firm innovation; it also can be a consequence of family managers' lack of resources and

capabilities to revitalize the firm. While agency theory and behavioral theory help to answer why family firms behave differently from nonfamily firms drawing on one perspective (the owners' intentions), these perspectives lack a comprehensive conceptualization of family firm innovation. In the following section, this research explores family firms' idiosyncratic abilities concerning firm innovation from a unique perspective.

### 2.1.3 Family Firms' Idiosyncratic Innovation Abilities

A few empirical studies on family firm innovation employ the RBV, exploring family firms' idiosyncratic resources and capabilities as the source of competitive advantages or disadvantages relating to firm innovation (Classen, Van Gils, Bammens, & Carree, 2012; Miller, Le Breton-Miller, & Lester, 2011; Sirmon, Arregle, Hitt, & Webb, 2008). In this research stream, family involvement is measured as family ownership (Ashwin, Krishnan, & George, 2015), family management (Ashwin et al., 2015; Sirmon et al., 2008), or generational involvement (Block, Miller, Jaskiewicz, & Spiegel, 2011; Miller et al., 2011). These studies have largely reported mixed findings (De Massis et al., 2013).

According to a number of conceptual studies employing the RBV, idiosyncratic resources and capabilities are generated in family firms and impact firm behavior in general (Habbershon et al., 2003; Sirmon & Hitt, 2003) and firm innovation in particular (Carnes & Ireland, 2013). Among the various types of family involvement in the business, family management is the typical focus in terms of the creation of such idiosyncratic resources and capabilities. First, the unification of ownership and management gives rise to an effective governance mechanism, family governance,

through which decisions can be made in a parsimonious, particular, and personal way (Carney, 2005). In addition, family members' embeddedness in the business enables the flow of social capital from the family into the firm (Arregle, Hitt, Sirmon, & Very, 2007; Pearson et al., 2008; Sirmon & Hitt, 2003), creating trust, cohesion, and stewardship within the firm (Davis et al., 2010). The goodwill associated with a family member's external connections can bridge new knowledge and information into the firm, thus contributing to new opportunity identification. In addition, strong bonding social capital can facilitate tacit knowledge sharing within the firm (Pearson et al., 2008), leading to effective innovation implementation. In particular, when family owner-managers have grown up with the business, a profound understanding of the business may be developed that shapes their idiosyncratic firm-specific human capital (Sirmon & Hitt, 2003). These deep firm-specific tacit knowledge resources can extend the firm's current capabilities and allow the firm to explore new opportunities through enriching activities (Carnes & Ireland, 2013).

A few empirical studies show direct or indirect evidence to support these arguments (Ashwin et al., 2015; Hsu & Chang, 2011; Llach & Nordqvist, 2010; Sirmon et al., 2008). Using data from India and comparing family firms with nonfamily firms, Ashwin and colleague (2015) find that family-owned firms invest more in R&D and attribute this positive effect to the stewardship orientation created in these firms. Llach and Nordqvist (2010) find that family firms have more qualified employees and that qualified employees are positively related to R&D (Llach & Nordqvist, 2010), suggesting resource endowments associated with these surveyed family firms. In addition, Hsu and Chang (2011) argue that strong social capital in family firms encourages the use of

behavioral strategic controls (e.g., formal and informal meetings), which is positively related with firm innovation. Further, firms that are family-owned and managed are less rigid when responses are needed in environments with high external imitation threats, indicating superior managerial capabilities associated with these firms (Sirmon et al., 2008).

However, familiness may be distinctive or constrictive (Habbershon et al., 2003). Despite family CEOs' salient managerial discretion, a number of studies regard family CEOs as less competent compared to their professional counterparts (Pérez-González, 2006), indicating resource constraints in family CEO-managed firms. In addition, high levels of familiness may result in rigid mental models in family firms (König, Kammerlander, & Enders, 2013), reinforcing the firms' commitment to the status quo (Gómez-Mejía, Nuñez-Nickel, Gutierrez, 2001) and leading to the pursuit of stabilizing activities (Carnes & Ireland, 2013). Further, the closure of family firms' elite networks derived from familiness excludes nonfamily members (Sirmon & Hitt, 2003), thus hindering idea generation and new product exploration in the firms (Carnes & Ireland, 2013). Finally, while cohesion is suggested to exist in the TMTs of family firms, conflicts also may arise with the involvement of multiple family members' (Ensley, Pearson, & Amason, 2002).

A few empirical studies show limited evidence for these arguments (Classen et al., 2012; Miller et al., 2011). Classen and colleagues (2012) suggest that family firms have a narrow search breadth concerning innovation, while family CEO education and the percentage of nonfamily members on the TMT tend to mitigate such negative impact. In addition, family CEO-managed firms are more likely to have conservative growth

strategies (e.g., firm innovation as one dimension of such growth strategies) than lone-founder CEO-managed firms, indicating that a nurturer identity is developed in the former and an entrepreneurial identity is developed in the latter (Miller et al., 2011).

To summarize, few studies employ the RBV, highlight family firms' abilities to innovate, and explore idiosyncratic resource endowments or constraints in terms of innovation (Classen et al., 2012; Miller et al., 2011; Sirmon et al., 2008). While some studies compare family firms with nonfamily firms and attribute the positive relationship to the family firm's possession of distinctive familiness (e.g., stewardship orientation; Ashwin et al., 2015), other studies attempt to identify idiosyncratic resources and capabilities associated with family firms (Classen et al., 2012; Hsu & Chang, 2011; Llach & Nordqvist, 2010; Miller et al., 2011). However, inconsistent findings usually surface in these studies.

Given that familiness may be either distinctive or constrictive (Habbershon et al., 2003), the impact of family involvement on firm innovation is more likely depending on heterogeneous resources and capabilities that are generated through various types of family involvement. In addition to relying on a model that only investigates family owners' unwillingness to innovate, research lacks a broad understanding of the ability that exists within family firms in terms of resources and capabilities. Accordingly, as a complementary perspective, the RBV offers a foundation for explaining the relationship between family involvement and firm innovation. Because familiness is usually associated with family members' involvement in top executive positions (Minichilli et al., 2010), family CEOs—as critical components manifesting the heterogeneity of family involvement—can influence firm innovation ability distinctively compared to nonfamily,

professional CEOs. In the following section, this research summarizes the research gap in family firm innovation literature and describes the value of a study exploring the role of family CEOs in firm innovation.

### 2.1.4 A Summary of Research Gap

The first section of this chapter reviews two schools of inquiry that explore family firm innovation. One (i.e., the intention perspective) primarily draws on agency theory and/or behavioral agency theory, compares family firms with nonfamily firms, and explores how family owners' distinctive intentions affect firm innovation (Block 2012; Chrisman & Patel, 2012; Gómez-Mejía et al., 2014). The other (i.e., the ability perspective) employs the RBV, primarily compares family firms with nonfamily firms, and investigates family firms' idiosyncratic abilities to innovate. The intention school predominantly reports a negative relationship between family involvement (e.g., family ownership) and firm innovation (e.g., R&D investments), suggesting that family firms are able yet unwilling to innovate. There are mixed findings regarding the ability school, indicating the heterogeneity associated with family firms' ability to innovate. While both schools of thought contend that family firms can "do more with less" (Duran et al., 2015), when this occurs remains less clear.

Innovation is more than R&D investment (Teece, 2007); innovation requires intense knowledge and various types of capabilities to identify new opportunities externally and to pursue these opportunities (Winter, 2003). Family firms tend to possess distinctive resources and capabilities generated through family management, such as a family member holding the CEO position (Minichilli et al., 2010). Therefore, family CEOs may behave distinctively with respect to firm innovation due to these idiosyncratic

capabilities deriving from family management, rather than merely from family ownership. Consequently, family CEOs may have a critical impact on innovation opportunity identification, pursuit, and resource orchestration. Research exploring why and how family management gives rise to idiosyncratic resources and capabilities and has an impact on family firm innovation can provide valuable insights.

To fill this research gap, this research focuses on the role of family CEOs in firm innovation and extends prior studies of the heterogeneity of family firm innovation. By employing this perspective, this research argues that the presence of family CEOs in firms may give rise to idiosyncratic capabilities to innovate. Next, this research presents a capability-based perspective of firm innovation to explore the top manager's role in firm innovation, thus, providing theoretical underpinnings for the development of hypotheses in the next chapter.

## 2.2 A Capability-Based Perspective of Firm Innovation

To understand firm innovation, scholars broadly draw on a set of theoretical perspectives (e.g., the RBV, organizational learning literature, and network theory) to explore how a variety of innovation determinants impact different dimensions of firm innovation (Crossan & Apaydin, 2010). The RBV, one of the most prominent perspectives in firm innovation literature, is employed to identify sustainable, unique, and valuable resources and capabilities as the sources of competitive advantage (Barney, 1991) in terms of firm innovation. However, distinctions exist between resources and capabilities. While resource endowments—referring to all of a firm's assets and organizational attributes (Barney, 1991)—are critical for new product and service development, innovation capabilities denote a special type of resource that is generated

by combining and recombining resources to make a firm dynamic (Amit & Schoemaker, 1993). Therefore, innovation capabilities, compared with resource endowments, are more critical to a firm's adaptation to changing environments. Aligned with this distinction, organizational literature emphasizes the dynamic nature of firm innovation and highlights the importance of continual innovation (Helfat et al., 2009). Accordingly, innovation capabilities of a dynamic nature are central to understanding a firm's competitive advantage from innovation.

Innovation—a process of exploiting opportunities to commercialize new products, services, and processes (Drucker, 1985)—reflects a firm's capability to respond to changing environments (Brown & Duguid, 1991). Superior firm innovation is determined by a firm's dynamic capabilities to a great extent, which can be disaggregated into the capacity of opportunity sensing, opportunity seizing, and resource transforming (Teece, 2009). In addition, these capabilities are associated with top managers and are derived from their managerial attributes (Adner & Helfat, 2003). Drawing on prior literature about firm innovation and dynamic capabilities, this section provides an integrated capability-based perspective of firm innovation, in an attempt to explain *how* and *why* firm innovation is influenced by top managers in a firm (Figure 2.1).

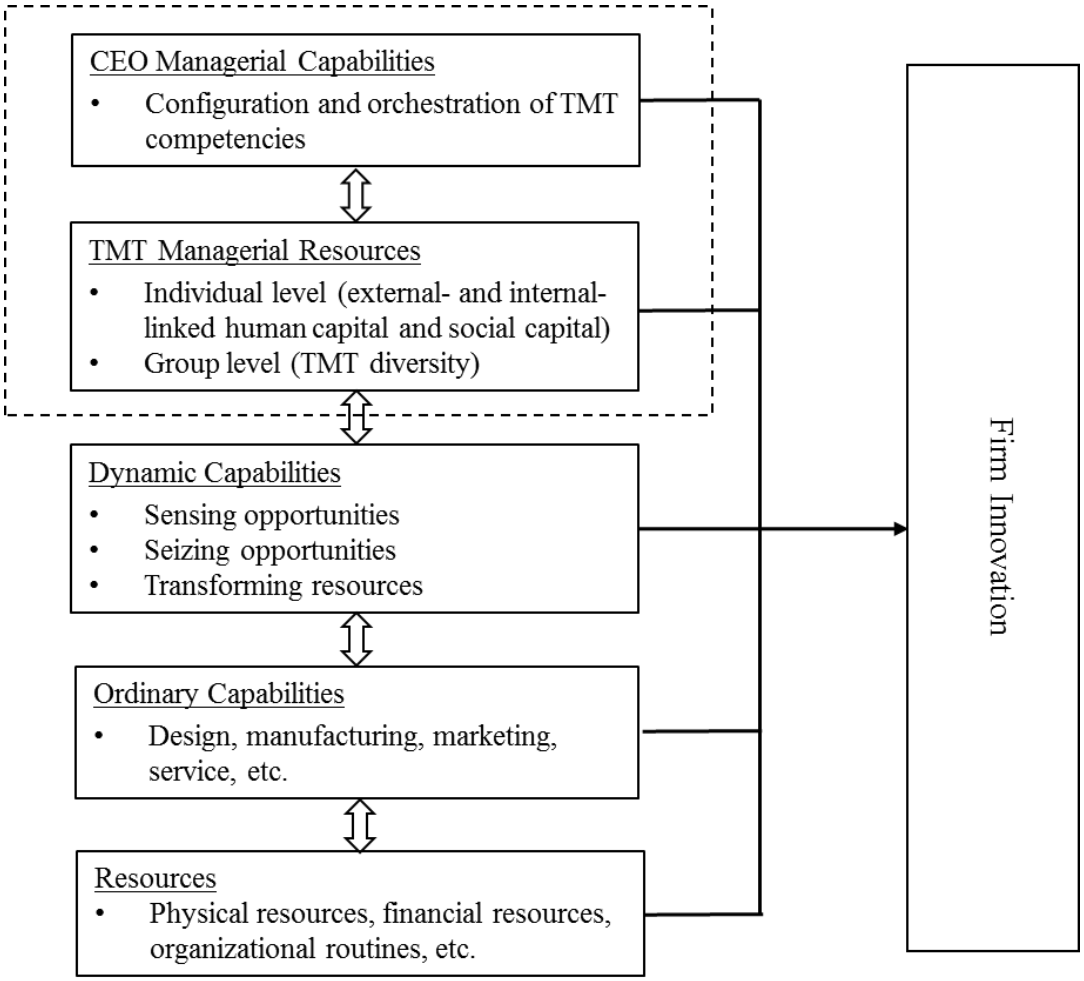


Figure 2.1 A Capability-Based Perspective of Firm Innovation: Resources and Capabilities underlying Firm Innovation

Note: All possible relationships between concepts are not completely presented in this figure. The dotted box highlights the focus of this research.

To present a capability-based perspective of firm innovation, this research first reviews the RBV in general and distinguishes capabilities from resources (2.2.1). In the following section, this research defines firm innovation (2.2.2), emphasizing the capabilities underlying firm innovation. Dynamic capabilities (2.2.3) are then introduced, highlighting the dynamic feature of firm innovation capabilities. Next, this research reviews TMT managerial resources (2.2.4) on which these dynamic capabilities depend

and highlights the leading role of a CEO in the TMT to explore the CEO's managerial capabilities (2.2.5), thus shedding light on *what* managerial attributes influence firm innovation and *why* these attributes influence firm innovation. Finally, a summary of the capability-based perspective of firm innovation (2.2.6) is presented, providing the basis for theoretical development in the next chapter.

### 2.2.1 The RBV: Resources and Capabilities

Based on the assumption that a firm's resources and capabilities are heterogeneous and less transferrable across firms, the RBV contends that a firm's competitive advantage comes from unique resources and capabilities possessed by the firm (Barney, 1986, 1991). To achieve sustainable competitive advantage, these distinctive competencies must be valuable, rare, inimitable, and non-substitutable within practical time and budget constraints (Barney, 1991; Dierickx & Cool, 1989). Among the various forms of competencies, such as physical assets, invisible capabilities, organizational processes, information, and knowledge (Barney, 1991), the CEO of a firm is identified as a particular form of firm resource that possesses idiosyncratic qualities and general, industry-specific, and firm-specific skills that are critical to decision-making and firm performance (Castanias & Helfat, 1991).

While distinctions exist between resources and capabilities (Amit & Schoemaker, 1993; Leiblein, 2011; Makadok, 2001), successful innovation can rely on unique resources and/or capabilities. Innovation capabilities may take the form of resource deployment, integration, reconfiguration, recombination, and divesture (Lee, 2008; Sirmon & Hitt, 2009; Leiblein, 2011; Sirmon et al., 2011). In comparison to resources, capabilities are more firm-specific, are deeply embedded in firms, and are less

transferrable across firms (Makadok, 2001), allowing firms to reconfigure resources to remain in congruence within a dynamic environment. As a consequence, capabilities are more likely to be built within firms rather than bought externally and to be developed as the source of competitive advantage (Teece, 2007).

Based on such distinctions, firms can create value through two different mechanisms: resource-picking and capability building (Makadok, 2001). The resource-picking mechanism primarily draws on managers' information and cognition to "pick" valuable and rare resources from external markets, while the capability-building mechanism depends on managers' "construction techniques" to deploy resources and to transfer "raw materials" internally (Makadok, 2001). Concerning firm innovation, firms may remain innovative through external technology acquisitions (Lichtenthaler, 2011; Van de Vrande, De Jong, Vanhaverbeke, & De Rochemont, 2009), which reflect a resource-picking mechanism. Alternatively, a capability-building mechanism for firm innovation underlines the central role of internal R&D activities in forming firms' competitive advantage.

### 2.2.2 Firm Innovation

In organizational studies, firm innovation refers to the adoption of changes within firms (Knight, 1967) and is described as a critical tool of firms to exploit external opportunities by providing newness (Drucker, 1985). Therefore, firm innovation consists of a set of activities (e.g., R&D investments and/or technology acquisitions) through which firms identify new opportunities and generate, accept, and implement new ideas (Thompson, 1965). Innovation also can be observed through a variety of outcomes, including improved products, services, and production processes (Kimberly, 1981;

Knight, 1967). While firm innovation can be internally invented or externally acquired (Cohen & Levinthal, 1990), this study focuses on internal firm innovation.

As one of the most critical firm behaviors that shape firm competitive advantage and influence firm performance (Thompson, 1965), firm innovation has two features. First, innovation is costly, given the required investments in critical resources and capabilities (Kirzner, 1978). Firms need to recognize the necessity for change, determine the search patterns and procedures, and find distinctive ways to respond to change (Knight, 1967; Cohen & Levinthal, 1990). During this process, new opportunities are recognized and critical activities (e.g., R&D investments) are required to seize these opportunities. Second, given the synergetic nature of newness generation, the essence of firm innovation is resource (re)combination and knowledge creation (Cohen & Levinthal, 1990). This synergetic process can be observed within a functional department (e.g., in the R&D department in which technological development is achieved), as well as for cross-functional coordination (Amit & Schoemaker, 1993; Pisano, 1997). Therefore, the outcome of firm innovation can be manifested as the launch of new products or as the increased sales achieved by selling these new products; the latter form considers the risks associated with the high uncertainty of customer acceptance of the new products (Grossman & Helpman, 1993) and relies on cross-functional coordination (e.g., the coordination among the R&D, production, and marketing departments) to a greater extent.

Firms differ widely concerning innovation. The difference primarily derives from firms' capabilities for new opportunity identification and resource orchestration to create the newness. When firms have superior opportunity recognition capabilities, they may

engage in intensive R&D activities (Amit & Schoemaker, 1993; Pisano, 1997). Superior innovation outcomes tend to be achieved when firms have greater integration and knowledge absorbing capabilities (Cohen & Levinthal, 1990; Grant, 1996; Henderson & Clark, 1990) to synthesize new streams of activities with the existing ones (Lawson & Samson, 2001). Accordingly, successful firm innovation requires adopting the best practices to create new products and delivering superior new products and services to customers (Teece, 2007). From this perspective, innovative firms tend to invest intensely in R&D (Teece, 2007) and to achieve superior innovation output in terms of converting R&D investments into sales (Eisenhardt & Martin, 2000).

To summarize, firm innovation, recognized as a critical driver for firm growth (Thompson, 1965), can be observed through innovation input (e.g., R&D investment) and innovation output (e.g., firm sales). To have a sustainable competitive advantage, firms must continually generate and implement complementary activities to respond to environmental changes (Teece & Pisano, 1994). The variations across firms concerning innovation are dependent primarily on firms' dynamic capabilities that enable them to sense and seize opportunities and to orchestrate resources to create newness (Teece, 2007). Not surprisingly, dynamic capability literature has been increasingly employed in organizational studies to advance the understanding of firms' competitive advantages in terms of innovation (Crossan & Apaydin, 2010).

### 2.2.3 Dynamic Capabilities

Organizational capabilities can be categorized into various levels, including ordinary capabilities and dynamic capabilities (Collis, 1994). While ordinary capabilities are embedded within firms' value creation activities through day-to-day living, dynamic

capabilities include the capabilities of opportunity sensing and seizing and asset orchestration that allow firms' adaptation to changing environments (Daspit, D'Souza, & Dicke, 2016; Eisenhardt & Martin, 2000; Teece, Pisano, & Shuen, 1997; Winter, 2003). According to the dynamic nature of competition, firms' competitive advantages concerning innovation are more likely derived from their superior dynamic capabilities rather than from their ordinary capabilities, especially for firms in high-velocity environments.

Dynamic capabilities can be disaggregated into the capabilities of opportunity sensing, opportunity seizing, and resource transforming (Teece, 2007). The opportunity sensing capability allows firms to continually scan, search, and explore—locally and distally—to identify opportunities and threats. During this process, firms need to overcome a narrow search horizon and to interpret new arising phenomenon in technologies and markets (Teece, 2007). Opportunity seizing requires activities such as R&D investments; investment patterns and timing are critical to superior opportunity seizing (Teece, 2007). The skills and leadership of top managers influence firms' resource orchestration capabilities, through which firms are able to recombine and reconfigure assets and resources internally (Teece, 2007). While opportunity sensing and seizing capabilities underpin firm innovation input, resource orchestration capabilities are more likely to have an impact on firm innovation output.

To build dynamic capabilities, firms need extensive external communications to sense necessary changes caused by external factors and to seize these recognized opportunities (Eisenhardt & Martin, 2000). Further, firms require cross-functional coordination and integration to orchestrate resources internally (Eisenhardt & Martin,

2000; Teece et al., 1997). Drawing on these two mechanisms, firms can create new patterns of activities through organizational learning and sustaining innovativeness (Brown & Duguid, 1991; Kim &Mahoney, 2010; Lawson & Samson, 2001; Teece et al., 1997).

Firms' dynamic capabilities partially reside within their top managers (including CEOs and other TMT members) (Adner & Helfat, 2003; Augier & Teece, 2009; Daspit, Ramachandran, & D'Souza, 2014; Kor & Mesko, 2013; Teece, 2012) and are largely determined by top managers' abilities to identify new opportunities and integrate new ideas and knowledge with the existing capabilities (Helfat & Raubitschek, 2000). Therefore, it is dynamic managerial capabilities—drawing on top executives' human capital, social capital, and cognition (Adner & Helfat, 2003)—that allow firms to innovate and revitalize. The next section reviews prominent managerial resources (e.g., human capital and social capital) associated with top managers and explores why these managerial competencies shape firms' dynamic capabilities in terms of firm innovation.

### 2.2.4 TMT Managerial Resources

Due to their central role in decision making and resource allocation, top managers are identified as innovation drivers of firms (Bantel & Jackson, 1989; Barker & Mueller, 2002; Hambrick & Mason, 1984; Qiang et al., 2013). Prior studies primarily draw on upper echelons theory, exploring how the experiences, skills, and cognitions of top managers shape firms' vision of innovation and predict firm innovation strategies (Crossan & Apaydin, 2010). According to upper echelons theory, the demographic characteristics of top managers (e.g., age, education level, firm tenure, and functional background) are proxies for the psychological constructs, such as values and beliefs, of

firms' adaptation to rapidly changing environments (Bantel & Jackson, 1989; Barker & Mueller, 2002; Hambrick & Mason, 1984).

Recently, capability literature has attracted increasing research attention, suggesting that top managers' human capital and social capital are micro-foundations of firms' dynamic capabilities (Helfat & Martin, 2015). The leadership experiences and skills of top managers shape firms' opportunity identification and resource configuration capabilities (Beck & Wiersema, 2013; Helfat & Peteraf, 2015; Teece, 2012). Accordingly, top managers' managerial attributes are predictors of firms' abilities to diagnose threats, their actions in response to changing environments, and their continual seeking of activities to renew (Adner & Helfat, 2003; Teece, 2012). In addition, TMTs are recognized as an integrated group within firms; therefore, the group-level characteristics of TMTs tend to influence firm innovation.

The next sections review TMT managerial resources by (a) categorizing these resources into externally- and internally-linked TMT resources and (b) discussing the group-level characteristics of these resources. To achieve this goal, this section is organized into two parts: (2.2.4.1) externally- and internally-linked TMT resources and (2.2.4.2) group-level TMT characteristics. In doing so, this research provides answers to the *what* question—what managerial attributes influence firm innovation—and sheds light on *why* and *how* top executives impact firm innovation.

#### 2.2.4.1 Externally- and Internally-Linked TMT Resources

Prior studies predominantly draw on upper echelons theory, positing that top managers make innovation decisions depending on their psychological characteristics, such as values and cognitions. Observable demographic characteristics (e.g., age,

education, tenure, and functional background) are used as proxies of managers' values and cognitions (Carpenter, Geletkanycz, & Sanders, 2004; Hambrick & Mason, 1984). According to these studies, top managers' education and firm tenure are critical predictors of firm innovation (e.g., Bantel & Jackson, 1989; Kor, 2006). For example, while a long-tenured manager accumulates firm-specific knowledge, the manager is also regarded as an insider lacking a new perspective of the business and tending to commit to the status quo and is thus less likely to invest in R&D (Kor, 2006). Accordingly, studies attempting to link top managers' firm tenure and innovation have reported mixed results (e.g., Auh & Menguc, 2005; Bantel & Jackson, 1989; Camelo, Fernández-Alles, & Hernández, 2010).

The literature on dynamic capabilities highlights top managers' critical roles in opportunity sensing, opportunity seizing, and resource transformation (Augier & Teece, 2009; Helfat & Martin, 2015). Unlike upper echelons theory, the literature on dynamic capabilities contends that top executives' knowledge, experiences, and skills are measures of their human capital and social capital rather than proxies of their psychological constructs, such as values and beliefs (Helfat & Martin, 2015). Human capital—referring to an individual's learned skills and knowledge relating to their cognitive abilities—can be developed through prior experience, training, and education (Ployhart & Moliterno, 2011). Consistent with strategic human capital literature (Wright, Coff, & Moliterno, 2014), studies on firm dynamic capabilities suggest that the substantial knowledge, experience, skill, and education possessed by top managers are critical to firms' search scope for newness, the speed of complex information processing,

and the transformation of resources to launch new products or new services (Helfat & Martin, 2015).

This research reviews these managerial resources, in an attempt to categorize them into two subgroups that underpin innovation input and innovation output. This research labels top managers' prior organizational experiences and current external connections (e.g., directorship in other firms) as externally-linked resources that shape top managers' perceptions of emerging innovation opportunities (Crossland, Zyung, Hiller, & Hambrick, 2014) and allow them to seize these opportunities (Kor, 2006). Conversely, firm tenure, team tenure, and intra-firm managerial variety—denoting internally-linked resources possessed by top managers—predict firms' resource transformation capabilities, through which coordination and integration can be achieved within the firms (Eisenhardt & Martin, 2000; Teece, 2007).

*Prior organizational experiences*. A top manager who has rich prior organizational experiences tends to have broad managerial insights. For instance, an organization's adoption of an innovation (i.e., the adoption of Total Quality Management in a hospital) is positively related to its top managers' previous exposure to such innovation in other organizations (Young, Charns, & Shortell, 2001). In addition, with high job variety in other organizations, a top manager tends to expand the network of ties by establishing a link between the previous organization and the new one (Granovetter, 1973). As a consequence, a top manager's migration across firms can expand the working experience and broaden the search scope for newness, acting as a diffusion mechanism for innovation to some extent (McKinney, Kaluzny, & Zuckerman, 1991). The evidence also shows that the diversity of top managers' prior (industry) experience decreases their

information redundancy and enhances new information exposure and opportunity recognition (Alexiev, Jansen, van den Bosch, & Volberda, 2010). Therefore, top managers' prior experiences in other organizations can enhance their perception of emerging innovation opportunities that underpin innovation input.

*External connections*. The goodwill embedded in top managers' external relationships can enhance firms' opportunity sensing and seizing capabilities (Helfat & Martin, 2015). Top managers' external connections give firms access to new information and knowledge, as well as human and financial capital (Adler & Kwon, 2002). For instance, entrepreneurs' social relationships abroad influence firms' geographic diversification (Prashantham & Dhanaraj, 2010), and managers' social networks can lead to superior firm performance (Acquaah, 2012; Geletkanycz & Hambrick, 1997). Among various forms of social relationships, top managers' directorships at other firms have a salient impact on strategic change (e.g., firm acquisition) through a learning process (Geletkanycz & Hambrick, 1997; Haunschild, 1993). Regarding firms' dynamic innovation capabilities, top managers' current external relationships at other organizations may help them seek advice externally, find joint solutions with other firms, and observe other firms' critical strategic decisions. Firms in which top managers have more external connections tend to invest more in R&D (Eisenhardt & Martin, 2000).

In summary, a top manager accumulates experiences and sharpens managerial skills by working in other organizations previously and/or serving in other organizations currently. These externally-linked resources are critical to firm innovation input because top managers with high levels of these resources can sense opportunities in a timely

manner and seize opportunities with required knowledge and resources. The role of these resources in firm innovation is salient, particularly in high-velocity environments.

After R&D investment occurs, firms need to allocate, combine, reconfigure, and orchestrate resources across functional departments to generate new products and services (Teece, 2007). Internally-linked managerial resources associated with top managers—firm tenure, team tenure, and intra-firm career variety—can contribute to this process, leading to firm growth through the successful selling of new products and services to customers. Thus, firm tenure, team tenure, and intra-firm career variety, labelled as internally-link managerial resources in this research, underpin innovation output.

*Firm tenure and team tenure.* Prior studies drawing on upper echelons theory treat firm tenure and team tenure as proxies of psychological constructs that reflect the top managers' attitudes toward firms' risky behaviors, such as the adoption of innovation (Bantel & Jackson, 1989; Hambrick & Mason, 1984). According to these studies, top managers with long firm tenure are less likely to undertake innovative activities due to their commitment to the status quo and their risk-averse propensities (Bantel & Jackson, 1989). In contrast, short-tenured top managers tend to invest more in R&D to prove themselves as competent (Chen, Hsu, & Huang, 2010; Kor, 2006). However, two meta-analyses report a non-significant (Damanpour, 1991) or a significant, positive association (Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Ciprés, & Boronat-Navarro, 2004) between firm/team tenure and firm innovation, indicating the potential necessity of taking an alternative perspective to explain the impact on firm innovation.

According to the capability-based perspective of firm innovation, top managers' tenure is a proxy of their managerial resource—a type of firm-specific knowledge possessed by managers and the common language shared among TMT members. In particular, long-tenured top managers have undertaken various assignments compared with less-tenured peers and thus have accumulated firm-specific expertise (Finkelstein, 1992; Damanpour & Schneider, 2006) that facilitates firm resource transformation (Smith, Collins, & Clark, 2005). In high-velocity environments where trust and common understanding among top managers are critical to the innovation implementation process (Kor, 2006), a long tenure, as one manifestation of TMT managerial resources, is beneficial to firm innovation output.

*Intra-firm career variety*. Managers coordinate and integrate activities internally. Top managers who have experienced various managerial positions within firms have accumulated cross-functional, firm-specific expertise (Finkelstein, 1992; Damanpour & Schneider, 2006). In addition, the managers expand the network of ties within firms and develop a better understanding of routines across functional departments. By linking individuals from different functional departments and sharing firm-specific knowledge and routines, top managers who have high intra-firm career variety can achieve better internal coordination and resource integration (Teece et al., 1997), thus facilitating innovation output.

In summary, top managers accumulate firm-specific knowledge with prolonged tenure and contribute to the development of cross-functional routines by taking various managerial positions within firms. These experiences and skills can enhance firms' resource transformation capabilities, especially during the innovation implementation

process, and therefore are critical to innovation output, especially in high velocity environments. After reviewing externally- and internally-linked resources associated with top managers in this section, the next section examines TMTs as integrated groups and discusses the group characteristics of these managerial resources that underlie firm innovation.

#### 2.2.4.2 Group-Level TMT Characteristics

To achieve the greatest return, TMT members must work together to identify new opportunities, explore possible solutions, and implement innovation strategies (Bantel & Jackson, 1989). While externally- and internally-linked resources reflect the individual-level competencies of top managers, group-level characteristics—such as the composition of TMT managers' knowledge, experiences, and skills—reflect a wide range of cognitions and beliefs and yield a stronger explanation of organizational behavior (Ndofor, Sirmon, & He, 2015) and firm innovation (Bantel & Jackson, 1989; Crossan & Apaydin, 2010). Among these characteristics, TMT diversity is a salient measure.

The existing literature argues that TMT demographic diversity (e.g., age, education, tenure, and functional background; Bantel & Jackson, 1989; Kor, 2006; Qian, Cao, & Takeuchi, 2013; Talke, Salomo, & Kock, 2011) is a critical predictor of firm innovation. However, opposite effects are suggested in prior studies, and empirical analysis yields less consistent findings. For example, while most literature suggests a positive relationship between TMT demographic diversity and firm innovation, Kor (2006) argues the opposite, noting that TMT functional diversity mitigates firm R&D due to divergent demands on firm resource allocation within TMTs. Concerning empirical findings, Kor (2006) reports a negative but non-significant relationship between TMT

functional diversity and R&D. Such an association is also observed for various forms of TMT diversity (e.g., tenure diversity and functional diversity) in a number of other studies (e.g., Bantel & Jackson, 1989; Camelo et al., 2010; Daellenbach & McCarthy, 1999). Not surprisingly, TMT diversity is a highly controversial topic in organizational studies (Certo, Lester, Dalton, & Dalton, 2006; Nielsen, 2010).

According to the capability-based perspective, top managers jointly conceptualize the business and shape innovation strategies (Kor & Mesko, 2013; Prahalad & Bettis, 1986). The composition of TMT managerial resources influences firm innovation behavior through resource allocation and utilization (Ndofor et al., 2015). For example, the diversity of TMT managerial resources may be beneficial because of the wide range of cognitions possessed by TMT members that gives rise to task conflicts and leads to new idea generation. TMT diversity may also generate interpersonal, affective conflicts detrimental to decision making and group integration (Amason & Sapienza, 1997; Certo et al., 2006; Ensley et al., 2002). While the beneficial effect is more likely to be observed in complex, non-routine decision making, such as innovation decisions in changing environments, the detrimental impact is salient in routine decisions that require fewer diverse perspectives (Bantel & Jackson, 1989; Certo et al., 2006; Hambrick & Mason, 1984).

The cohesion within TMTs can mitigate the above-mentioned negative effect of TMT diversity (Certo et al., 2006) that is largely dependent on the exchange systems used to guide interactions among TMT members. Cohesion, as an important trait of integrative teams (Bollen & Hoyle, 1990; Long & Mathews, 2011), can mitigate affective conflicts and enhance cognitive conflicts, thus contributing to effective coordination and new idea

creation within teams (Ensley et al., 2002). However, the development of group cohesion is determined by the nature of interactions, which are guided by exchange systems (e.g., generalized vs. restricted) employed within TMTs (Long & Mathews, 2011). Generalized exchange systems are grounded in norms that value long-term reciprocal interactions and focus on group-interests. In contrast, restricted exchange systems are based on contractual arrangements and rely on short-term utilitarian calculations of self-interest (Ekeh, 1974). TMTs in which generalized exchange systems are present tend to develop high levels of cohesion and trust (Long, 2011; Long & Mathews, 2011) and in turn to mitigate affective conflicts that arise from TMT diversity and contribute to task conflicts that are beneficial to creative thinking. Accordingly, TMT diversity can be a positive predictor of firm innovation, especially when generalized exchange systems are used for interactions within TMTs.

In summary, top managers are critical determinants of firm innovation (Bantel & Jackson, 1989; Crossan & Apaydin, 2010; Helfat & Martin, 2015). This section reviews substantial TMT managerial resources that underlie firm innovation and categorizes them into externally-linked resources (i.e., prior organizational experiences and external connections) and internally-linked resources (i.e., firm tenure, team tenure, and intra-firm career variety). This section further explores group-level characteristics of TMTs (e.g., TMT diversity) that underlie firm innovation. The next section highlights the leading figure in TMTs— the CEO of the firm— to explore the unique role of a CEO in firm innovation.

### 2.2.5 CEOs' Managerial Capabilities

The leading role of CEOs in firm innovation has been explored in numerous studies (Hambrick, 1994; Ling, Simsek, Lubatkin, & Veiga, 2008; Peterson, Martorana, Smith, & Owens, 2003). Grounded in the argument that CEOs have significant power, authority, and discretion in firm decision making, prior studies suggest that CEOs' demographic characteristics (Barker & Mueller, 2002; Kitchell, 1997), leadership styles (Chen, Tang, Jin, Xie, & Li, 2014; Kang, Solomon, & Choi, 2015), focus on or attitudes toward innovation (Musteen, Barker, & Baeten, 2010; Yadav et al., 2007), and promotion type (i.e., promoted from within or hired from the outside; Balsmeier & Buchwald, 2015) are predictors of firm innovation. While these studies identify CEOs' leading role in firm innovation and distinguish them from other TMT members, little effort has been conducted to understand the interactions between CEOs and TMTs or to explore the integrated effects of CEOs and TMTs on firm innovation.

The literature on dynamic capabilities provides valuable insights to advance the understanding of the interactions between CEOs and TMTs. According to these studies, firms' competitive advantage is primarily based upon dynamic managerial capabilities (Adner & Helfat, 2003: 1012). Among the many capabilities, CEOs' capability to configure and orchestrate other TMT members is identified (Kor & Mesko, 2013), which is critical to understanding strategic leaders' integrated role in innovation (Bergh, Aguinis, Heavey, Ketchen, Boyd, Su, Lau, & Joo, 2016).

*The configuration of TMT resources.* CEOs of firms are considered the architects of TMTs, influencing TMT composition and diversity (Cannella & Holcomb, 2005; Finkelstein, 1992). This managerial function is facilitated when CEOs identify, recruit,

promote, and recombine TMT members' managerial skills and expertise (Kor & Mesko, 2013; Shen & Cannella, 2002). During this process, CEOs employ their own beliefs about their businesses during the TMT recruitment and promotion process to identify managerial knowledge and skills that are required in their firm. In addition, CEOs interact with other TMT members and influence their retention in the firm (Cannella & Holcomb, 2005; Kor & Mesko, 2013). Therefore, through TMT members' recruitment, promotion, and retention, CEOs configure TMT competencies (Kor & Mesko, 2013).

*The orchestration of TMT resources.* CEOs have essential power and discretion to orchestrate TMT members' competencies (Kor & Mesko, 2013). The orchestration role describes the process through which CEOs, acting like orchestra conductors, elicit harmonious performance from TMT members and integrate specialized knowledge to achieve better group-level performance (Kor & Mesko, 2013). This managerial function can be facilitated effectively when CEOs create a salient innovative vision of the business (Sucheta & Chen, 2014; Yadav et al., 2007), foster an organizational culture that encourages productive interactions and mutual learning (Hernandez, 2012; Mintzberg, 2009), and enhance coordination and synergies within the TMT (Kor & Mesko, 2013).

To summarize, CEOs possess power, legitimacy, and discretion to form the vision of the firm and implement innovation strategies (Barker & Mueller, 2002; Kitchell, 1997; Yadav et al., 2007). Their unique role in firm behavior is partly conducted through the configuration and orchestration of TMT competencies (Kor & Mesko, 2013). Acting as architects of TMT competencies, CEOs influence the configuration of TMTs through TMT recruitment, promotion, and TMT resource recombination. CEOs can also promote strong team cooperation through effective coordination and integration. Thus, the role of

CEOs in firm innovation is distinct from that of other TMT members, reflecting CEOs' managerial capabilities.

### 2.2.6 A Summary of the Capability-Based Perspective of Firm Innovation

The preceding section provides a capability-based perspective of firm innovation. Drawing on the RBV, prior studies suggest that the difference in innovation across firms derives from valuable and sustainable distinctive resources and capabilities possessed by these firms (Barney, 1991). In dynamic environments, firms need to adapt to external changes; therefore, competitive advantage in terms of innovation primarily relies on firms' dynamic capabilities for opportunity sensing and seizing and resource transforming (Eisenhardt & Martin, 2000; Teece, 2009). As such, this research draws on the capability-based perspective of firm innovation, suggesting that firms' competitive advantage in terms of firm innovation comes from their dynamic capabilities.

Since TMTs are the most important group within organizations (Carpenter et al., 2004), a number of studies argue that firms' dynamic capabilities to innovate lie in TMT members' competencies (Adner & Helfat, 2003; Helfat & Peteraf, 2015). In addition to externally- and internally-linked resources associated with top managers, group-level characteristics of TMTs, such as TMT diversity, are strong predictors of firm innovation (Crossan & Apaydin, 2010). This research reviews TMT managerial resources that underpin firm innovation and discusses the effect of TMT diversity on firm innovation, shedding light on the necessity of building an integrated CEO–TMT model concerning firm innovation and of understanding the integrated behavior of CEOs and TMTs. To achieve this goal, this research discusses CEOs' configuration and orchestration of TMT

competencies. In doing so, this chapter provides the theoretical foundation for Chapter III in an attempt to explore the role of a family CEO in firm innovation.

## 2.3 Chapter Summary

Family firm innovation has attracted increasing research attention in the past decade and has yielded inconsistent findings (e.g., De Massis et al., 2013; Duran et al., 2015). While a negative relationship between family ownership and innovation input is reported in a number of studies (e.g., Block, 2012; Chrisman & Patel, 2012; Chen & Hu, 2009), such an effect is not observed in relation to innovation output. Prior studies suggest that family firms are able to innovate yet are unwilling (Chrisman et al., 2015) and that they can "do more with less" (Duran et al., 2015). However, *why* and *when* family firms have such abilities remains less clear. Drawing on the heterogeneous nature of family involvement, this chapter reviews the impact of unique intentions and idiosyncratic resources that arise from various types of family involvement in firm innovation. According to the existing literature on family firm innovation, a research gap is identified, indicating that family CEOs are critical elements in understanding family firms' idiosyncratic abilities of firm innovation.

This chapter expands these insights to present a capability-based view of firm innovation. Drawing on the differences between resources and capabilities, this research suggests that firms' innovation-related competitive advantage comes from their dynamic capabilities and that these capabilities derive from top managers' competencies. In particular, top managers' externally- and internally-linked resources, the diversity of these resources, and CEOs' configuration and orchestration of these resources indicate higher-level capabilities that facilitate firm innovation. This chapter highlights the role of

top managers' resources and capabilities in firm innovation, providing a framework to explore family CEOs' distinctive impact on firm innovation in Chapter III.

Applying this capability-based perspective to the study of family business, this research suggests that the role of family CEOs in firm innovation is two-fold. First, family CEOs tend to have a direct impact on firm innovation because of unique goals and idiosyncratic resources. Chapter III draws on family business literature to develop baseline hypotheses concerning the direct impact of family CEOs on firm innovation. Family CEOs' indirect impact on firm innovation is then facilitated through the configuration and orchestration of TMT resources. When family CEOs pursue family-centered noneconomic goals, firms are less likely to recruit talented TMT members, whereas, once hired, TMT members tend to develop idiosyncratic firm-specific managerial resources during their retention. Chapter III explores the mediation effect of TMT members' managerial resources on the hypothesized family CEO–firm innovation relationship. In addition, family CEOs tend to employ generalized exchange systems to manage interactions among TMT members that underpin the CEOs' orchestration of TMT resources. Chapter III explores family CEOs' moderating impact on TMTs' resource–firm innovation relationship.

# CHAPTER III

# THEORETICAL DEVELOPMENT

The purpose of this chapter is to develop the theoretical arguments and the hypothesized relationships to be examined. Building on the review presented in Chapter II, a series of hypotheses are introduced. This chapter is organized into the following sections: (3.1) overview, (3.2) CEO type and firm innovation, (3.3) the family CEO's configuration of TMT resources and firm innovation, (3.4) the family CEO's orchestration of TMT resources and firm innovation, and (3.5) chapter summary.

## 3.1 Overview

The primary objective of this research is to further the current understanding of family CEOs' distinctive role in firm innovation by exploring the idiosyncratic capabilities associated with family management. This research draws on a capability-based perspective of firm innovation to explore the idiosyncratic resources and capabilities deriving from family management (family CEO) that underlie firm innovation. In particular, it employs both a direct and an indirect model to examine family CEOs' unique role in firm innovation.

Drawing upon a capability-based perspective of firm innovation, this research contends that firm innovation is one manifestation of a firm's capability for new opportunity sensing and seizing and resource transformation. According to this perspective, firm innovation input (i.e., R&D investment) is depicted as a sequence of

strategic activities undertaken to capture recognized opportunities. Through resource transformation, strategic assets are aligned internally, and consequently, innovation output is achieved and firm sales are increased (Helfat & Peteraf, 2015; Sirmon et al., 2011). From this perspective, low levels of innovation input observed in family firms can be the result of family CEOs' inability to identify and seize new opportunities. On the other hand, such firms can do better with firm innovation output due to the idiosyncratic managerial capabilities for resource recombination and integration associated with family CEOs. The main effects of family CEOs on firm innovation are developed in section 3.2.

In large firms, CEOs are rarely the sole decision makers but neither do they share equal power and legitimacy with other TMT members in decision making. Despite CEOs' leading role in TMTs, the existing literature is restricted to exploring the impact of either party on firm innovation, rarely allowing both or addressing how CEO–TMT interactions influence critical decision making and firm behavior (Ling et al., 2008; Peterson et al., 2003). In addition to acknowledging the direct effects of CEOs on innovation, this research distinguishes CEOs from other TMT members, suggesting that the role of CEOs in firm innovation is also indirect, via the configuration and orchestration of other TMT members' competencies. In particular, this research argues that family CEOs configure TMT resources distinctively; therefore, firms managed by such CEOs have different TMT resource endowments and/or constraints that mediate the relationship between CEOs and firm innovation. The hypotheses are developed in section 3.3.

Further, CEOs play a key role in orchestrating TMT competencies. Like orchestra conductors, CEOs combine and integrate the specialized and diverse knowledge of TMT

members to achieve greater performance (Kor & Mesko, 2013). During this process, family CEOs tend to use generalized exchange systems, leading to cohesive and integrative behavior on the part of TMTs and contributing to the pursuit of new opportunities and resource transformation in changing environments. In this way, family CEOs behave distinctively concerning the orchestration of TMT competencies. This research argues that family CEOs moderate the relationship between TMT managerial resources and firm innovation; the moderating effect derives from idiosyncratic managerial capabilities associated with family CEOs. The moderating effect of family CEOs on the TMT resource–firm innovation relationship is hypothesized in section 3.4.

A summary of hypothesized relationships is presented in Table 3.1. A research model of this study is illustrated in Figure 3.1 and a summary (section 3.5) is provided at the end of this chapter.

Table 3.1 Hypothesized Relationships

| | |
|---|---|
| Main effect: CEO type and firm innovation | |
| H1 | A family CEO-managed firm has less innovation input than a professional CEO-managed firm. |
| H2 | A family CEO-managed firm has greater innovation output than a professional CEO-managed firm. |
| Mediation effect: TMT managerial resources as mediators (configuration role of family CEO) | |
| H3 | Externally-linked TMT resources (i.e., prior organizational experiences and external connections) partially mediate the relationship between the presence of a family CEO and firm innovation input, such that a family CEO-managed firm has lower levels of such resources than one that is professionally managed, with these TMT resources being positively related to innovation input. |
| H4 | Internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety) partially mediate the relationship between the presence of a family CEO and firm innovation output, such that a family CEO-managed firm has higher levels of such resources than one that is professionally managed, with these TMT resources being positively related to innovation output. |
| H5 | Family involvement in the TMT strengthens the relationship between the presence of a family CEO and externally-linked TMT resources (i.e., prior organizational experiences and external connections), such that the relationship is more negative when family members are involved in the TMT. |
| H6 | Family involvement in the TMT strengthens the relationship between the presence of a family CEO and internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety), such that the relationship is more positive when family members are involved in the TMT. |
| Moderating effect: Family CEO as moderator (orchestration role of family CEO) | |
| H7 | A family CEO positively moderates the relationship between externally-linked TMT resources (i.e., prior organizational experiences and external connections) and innovation input. |
| H8 | A family CEO positively moderates the relationship between internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety) and innovation output. |

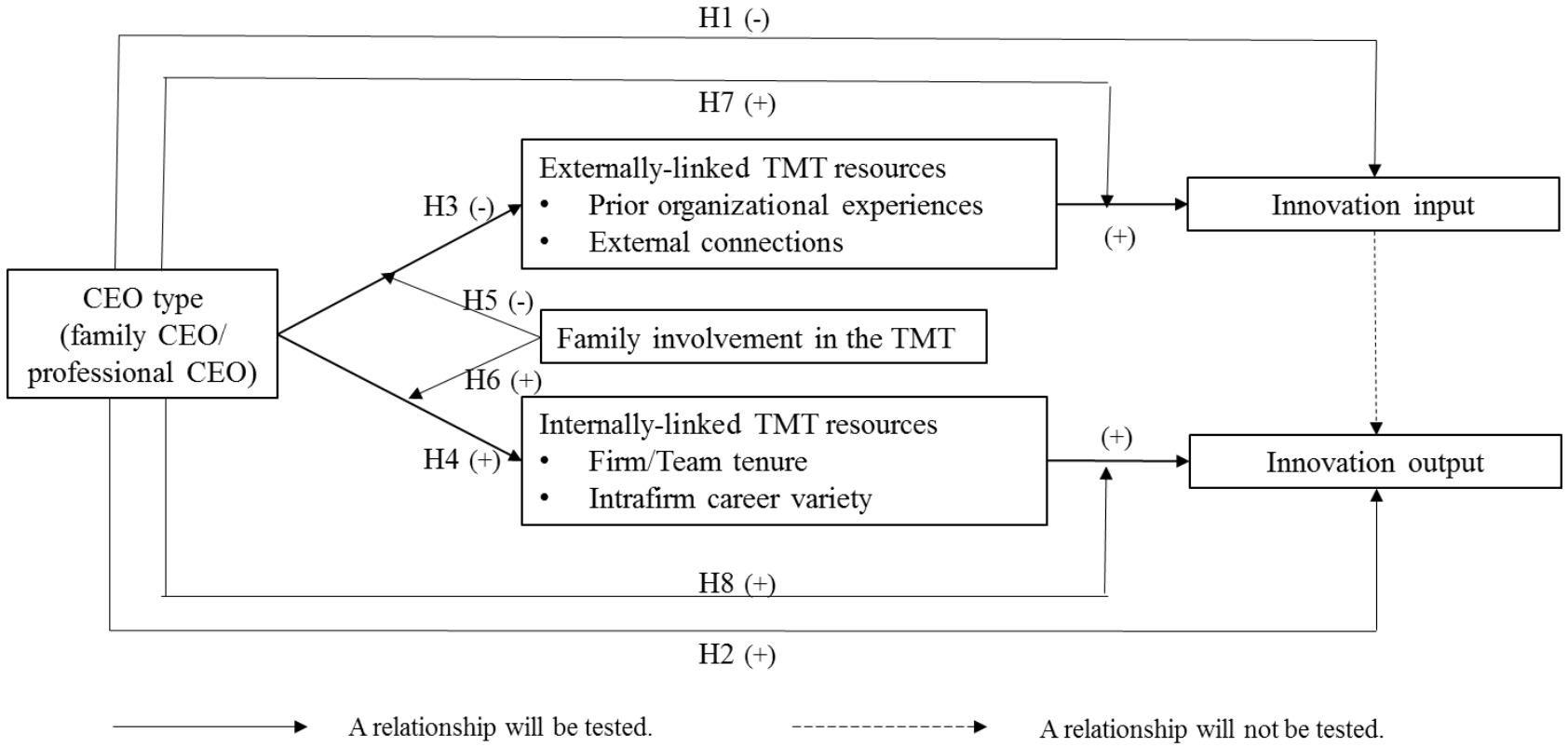


Figure 3.1 Research Model of Family CEO and Firm Innovation

## 3.2 CEO Type and Firm Innovation

*CEO type and innovation input.* According to the capability-based perspective of firm innovation, innovation input is contingent upon the extent to which firms recognize innovation opportunities and the extent to which firms take activities to seize these opportunities. Top managers' prior experience, knowledge, skills, and social connections are critical predictors for opportunity sensing and seizing activities (Kor & Mesko, 2013). Compared to professional CEOs, family CEOs are argued to have constrained managerial resources, which undermine innovation opportunity sensing and seizing with respect to innovation input.

Identifying innovation opportunity requires a variety of cognitive capabilities. Perception, one specific type of cognitive capability underlying opportunity sensing, denotes the mental activities entailing the selection and the interpretation of relevant information (American Psychological Association, 2009). Shaped by an individual's prior knowledge and expectation, the cognitive capability of perception affects an individual's information filter and quick recognition of emerging opportunities (Helfat & Peteraf, 2015). Family CEOs, selected from a small pool of qualified candidates within the family, are usually promoted to the CEO position in a faster way than their professional counterparts and lack substantial working experiences outside the firm (Schulze et al., 2001, 2003). As a contrast, professional CEOs selected from an open candidate-pool tend to have diverse prior organizational experiences and more social connections, which help to shape their new perceptions on business and contribute to new opportunity recognition.

After recognizing innovation opportunities, decision-making is required concerning seizing these opportunities. Opportunity seizing entails reasoning and problem-solving activities, including the justification of an investment and the acquisition of required resources (Helfat & Peteraf, 2015). Unlike their professional counterparts, family CEOs tend to justify an innovation investment by using both economic and noneconomic criteria. For instance, the family CEO's emotional attachment to the firm arises from a deep embeddedness in the businesses; family CEOs may preserve these emotional attachments (e.g., control of their firm) in the firm at the expense of other shareholders' economic benefits (Gómez-Mejía et al., 2007, 2011). Given the fact that firm innovation is risky, the requirement of financial capital and human capital indicates the loss of family control to some extent (Gómez-Mejía et al., 2014). When family CEOs justify or reason the recognized opportunities, the propensity to preserve their gained emotional attachment may lead to family CEOs' conservative decisions that distract firms from economic requirements (Gómez-Mejía et al., 2011; Miller et al., 2014). As a result, family CEOs' noneconomic concerns shape firms' resource allocation decisions, which lead to the development or underdevelopment of capabilities in terms of firm innovation (Miller & Le Breton-Miller, 2006). Due to these reasons, firms managed by family CEOs are less likely to seize recognized innovation opportunities, leading to low levels of innovation input in these firms than in firms managed by professional CEOs.

In summary, this research hypothesizes a direct relationship between CEO type and firm innovation, suggesting firm-level consequences (i.e., decision-making concerning innovation input) of CEO type. Compared to professional CEOs hired by both family and nonfamily firms, family CEOs are constrained in sensing and seizing

innovation opportunities due to their limited perceptions and the family-related reasoning process. As a result, firms managed by family CEOs tend to invest less in innovation input than those managed by professional CEOs.

*H1: A family-CEO-managed firm has less innovation input than a professional-CEO-managed firm.*

*CEO type and innovation output.* After making the decision to seize opportunities through R&D activities, a firm needs to facilitate resource recombination and integration, through which R&D investments can be converted into new products to increase sales. From this perspective, the essence of firm innovation is resource (re)combination and integration, the success of which largely depends on synergies during the process of newness generation (Cohen & Levinthal, 1990). Integration is difficult and costly, requiring deep firm-specific tacit knowledge, a culture of fostering knowledge sharing, and effective governance mechanisms to facilitate required activities. Unlike general knowledge, which can be acquired outside the firm, firm-specific knowledge is less transferrable (Grant, 1996). It is only when the CEO gains a deep understanding of the firm that best practices can be adopted. An organizational culture that is fueled by long-term commitment and characterized by trust can disseminate knowledge throughout the firm (De Long & Fahey, 2000; Kankanhalli, Tan, & Wei, 2005), leading to effective resource integration and (re)combination.

Family CEOs can enhance firm innovation output in a distinctive manner. In such firms, the family and the business are intricately intertwined (Aldrich & Cliff, 2003). Familiness, as a bundle of unique, inseparable, synergistic, and deeply embedded resources and capabilities (Habbershon et al., 2003), is often explored by considering

family involvement in top managerial positions (Minichilli et al., 2010). For family CEOs, the interactions between the family, the business, and the individual give rise to idiosyncratic, firm-specific, and tacit knowledge, primarily due to the family CEOs' deep embeddedness in the business (Habbershon et al., 2003; Sirmon & Hitt, 2003). For instance, the early active involvement of children in the firm to gain a strategic education in the business enables the later generation to undergo enriching work experiences that are relevant for critical positions within the firm (Cabrera-Suárez, De Saá-Pérez, & García-Almeida, 2001; Jaskiewicz, Combs, & Rau, 2015). Family CEOs, with firm-specific tacit knowledge that has a lesser degree of transferability, enable the adoption of best practices in terms of innovation and help to deliver superior new products to customers, which contribute to innovation output.

Second, family CEOs are more likely to nurture a strong firm culture that encourages knowledge-sharing activities and enhances resource integration. Organizational culture—as one specific type of strategic resource that generates a sustainable competitive advantage for firms (Barney, 1986)—can promote learning, risk taking, and innovation (e.g., De Long & Fahey, 2000). Firms managed by family CEOs can build a distinctive and hard-to-imitate organizational culture due to the ambiguity of their origin and the families' embeddedness in their firms' history and dynamics (Gersick, 1997). Unlike professional CEOs, family CEOs are the ideal person to foster a stewardship atmosphere (Davis et al., 2010) that encourages knowledge sharing within firms (Carnes & Ireland, 2013). In addition, family CEOs can create strong ties within the firm to enhance interactions among individuals in the firm (Arregle et al., 2007; Long, 2011; Pearson et al., 2008; Sharma, 2008). Consequently, the strong culture within the

firm promotes knowledge-sharing and resource combination (Carnes & Ireland, 2013), further contributing to innovation output.

Family management, as a governance mechanism, coordinates resource recombination and integration in an effective way (Anderson & Reeb, 2003; Carney, 2005). To achieve superior innovation output, firms need a clear vision and efficient routines through which their current activities can be extended into new streams and resources can be reconfigured and recombined to meet the new requirements (Sirmon, Hitt, & Ireland, 2007). When a family member takes the CEO position of a firm, interactions between the family and the business occur on a constant basis and the resource-enriching capabilities can be enhanced. The control systems taken by the family CEO increase the efficiency of resource recombination and integration (Carnes & Ireland, 2013), yet another factor that plays a part in superior innovation output.

In summary, this section hypothesizes a direct relationship between CEO type and innovation output. Compared to professional CEOs hired by both family and nonfamily firms, family CEOs have substantial, firm-specific tacit knowledge gained through deep embeddedness in their firms. They tend to foster a strong organizational culture that encourages knowledge sharing and to employ effective governance mechanisms to coordinate internal activities. Even though family firms managed by family CEOs may invest less on R&D, these firms can be more efficient than those managed by professional CEOs in terms of innovation output at the given innovation input level.

*H2: A family-CEO-managed firm has greater innovation output than a professional-CEO-managed firm.*

### 3.3 Family CEOs' Configuration of TMT Resources and Firm Innovation

This section distinguishes the CEO's leading role in the TMT and explores family CEOs' configuration of TMT resources. Family CEOs' influence on firm innovation is partially mediated through TMT managerial resources; this mediation effect is manifested as family CEOs' configuration role. This role is fulfilled through family CEOs' managerial discretion with respect to recruiting and promoting TMT members and developing TMT resources during their retention (Kor & Mesko, 2013). Compared to those hired by professional-CEO-managed firms, TMT members recruited, promoted, and retained by family-CEO-managed firms tend to have different characteristics in terms of their managerial competencies, which are manifested as managerial resource endowments and constraints in family firms. Therefore, in addition to the direct impact on firm innovation, family CEOs influence TMT managerial resource configurations such that the latter partially mediate the relationship between family CEOs and firm innovation. In particular, this research explores the family CEO's configuration of TMT externally and internally linked resources, hypothesizing a mediation effect of TMT resources in relation to the family CEO and firm innovation relationship. The discussion is also extended to a specific situation in which family members other than family CEOs are involved in TMTs, in an attempt to explore the joint impact of family CEOs and family involvement in TMTs on TMT resource configuration.

*Configuration of TMT externally-linked resources.* Compared to professional CEOs, family CEOs tend to develop strong emotional attachments to their firm (Gómez-Mejía et al., 2011). Emotions usually arise as an inseparable part of daily organizational work (Ashforth & Humphrey, 1995). These emotional attachments are not exclusively

possessed by family CEOs; however, family CEOs tend to feel them particularly strongly due to the family-related vision of the firm and the perception of firm history with blurred boundaries between families and firms (Berrone et al., 2012; Chua et al., 1999; Zellweger & Astrachan, 2008). These distinctive emotional attachments—manifested as family CEOs' belonging, affect, sense of family legacy, and security of career in firms—play a critical role when family-CEO-managed firms recruit and promote TMT members with the purpose to reinforce the family control or sustain family harmony (Chrisman et al., 2012). Further, the intention to preserve these emotional attachments influences firms' critical strategic decisions, such as those to do with diversification, IPOs, and R&D investment (Gómez-Mejía et al., 2014; Gómez-Mejía, Makri, & Kintana, 2010; Zellweger et al., 2012). As a consequence, family firms managed by family CEOs may pursue family-centered noneconomic benefits deviated from economic concerns (Chrisman et al., 2012; Gómez-Mejía et al., 2007). Such pursuits shape firms' capabilities in the long run (Miller & Le Breton-Miller, 2006) and reduce the attractiveness of firms to talented managers, impeding the recruitment and promotion of competent top managers in the firms to a great extent (Chrisman et al., 2014).

In addition, compared to professional CEOs, family CEOs have great potential to sustain family control through transgenerational succession arrangement (Long & Chrisman, 2014; Zellweger et al., 2012), which affects the interests of relevant stakeholders (Daspit, Holt, Chrisman, & Long, 2016). Taking a nonfamily manager hired by a family CEO-managed firm as an example of these relevant stakeholders, the transgenerational succession intention eliminates the possibility of a nonfamily TMT member being promoted to the CEO position, which demotivates nonfamily TMT

members due to the perceived limited career potential. This is further evidence that family CEOs have a group-level influence on TMT resource endowments or constraints.

The hiring of top managers with widely diverse career backgrounds is among the most striking trends in large firms (Crossland et al., 2014). TMT members' diverse career experience and their current external connections (i.e., directorship in other firms) are regarded as specific managerial resources that help to create novelty in firms (Crossland et al., 2014). Firms managed by family CEOs are less likely to recruit such talented TMT members due to differing interests between family CEOs and nonfamily TMT members and the limited career development potential for the latter.

In summary, this research argues that, in addition to firm-level consequences (i.e., firm innovation), CEO type has an impact on TMT resources in terms of influencing the TMT recruitment and promotion processes, such that firms managed by family CEOs are less likely to recruit and promote competent individuals with a variety of experiences and skills. Because externally-linked TMT resources—such as prior organizational experiences and external connections—are beneficial to firm innovation input, this research hypothesizes that such resources mediate the negative relationship between family CEOs and innovation input.

> *H3: Externally-linked TMT resources (i.e., prior organizational experiences and external connections) partially mediate the relationship between the presence of a family CEO and firm innovation input, such that a family-CEO-managed firm has lower levels of such resources than one that is professionally managed, with these TMT resources being positively related to innovation input.*

*Configuration of internally-linked TMT resources.* The presence of family CEOs in firms may lead to resource constraints during the TMT recruitment process; however, TMT members hired by firms can eventually develop idiosyncratic resources or capabilities due to family CEOs' distinctive role in TMT resource combination. In particular, family CEOs tend to create a strong family firm identity and stewardship atmosphere (Davis et al., 2010; Zellweger et al., 2010) on one hand, to retain competent TMT members. On the other hand, family CEOs have salient managerial discretions and are motivated to monitor other TMT members, which may increase top management change caused by the leave of incapable TMT members. Thus, family-CEO-managed firms tend to have diverse TMTs in terms of firm tenure and team tenure. Furthermore, during their tenure, TMT members tend to develop a wide variety of intrafirm managerial experiences due to family CEOs' willingness to encourage TMT members' on-the-job learning and family CEOs' firm-specific knowledge to appoint TMT members to appropriate managerial positions to achieve better synergy.

Firm identity describes how individuals within a firm develop a shared understanding of it, by which the firm can be distinguished from others (Ashforth & Mael, 1989). Family business studies suggest that a salient family firm identity is one manifestation of idiosyncratic familiness generated through family involvement; this identity can also be shared among nonfamily members (Zellweger et al., 2010). Compared to professional CEOs, family CEOs tend to influence the firm's identity formation process in a distinctive way. For instance, family CEOs tend to define the business as part of the family's legacy, imprint family-related personal values on the organizational culture, and create the means by which the firms become distinctive

(Klein, Astrachan, & Smyrnios, 2005). Through this process, firms managed by family CEOs are more likely to develop a stronger family-related identity than their professionally managed counterparts. As touched on above, this powerful identity can be extended to nonfamily managers (Karra, Tracey, & Phillips, 2006; Zellweger et al., 2010), creating a feeling of unity and leading to a long tenure of capable TMT members.

Compared to professional CEOs, family CEOs are more motivated and capable to monitor other TMT members and, thus, to run the business in an effective way (Miller & Le Breton-Miller, 2006). On the one hand, a family CEO, usually having concentrated wealth in the firm, has strong intentions to manage and monitor other top managers (Carney, 2005). On the other hand, engaging in daily managerial practices, a family CEO has more inside information to monitor these top managers (Jensen & Meckling, 1976). For high-technology firms, top managers need to take actions quickly in response to changing environments. The lack of adaptiveness is a signal that the top manager is incapable in an industry with high-velocity. Thus, the salient managerial discretion and effective monitoring effects associated with a family CEO may lead to the exit of incapable TMT members.

Taken together, the presence of a family CEO leads to a more diverse TMT in term of tenure: long tenure for capable top managers and short tenure for incapable ones. While long tenure can increase TMT members' firm-specific knowledge and team-shared language (Finkelstein, 1992; Damanpour & Schneider, 2006), short-tenured TMT members can bring new managerial insights into the firm and the top management team (e.g., Bantel & Jackson, 1989; Hambrick & Mason, 1984). Thus, TMTs consisting of managers with diverse tenure reflect a combination of a wide range of managerial

cognition and a bundle of heterogeneous firm-specific knowledge and team experience, which are beneficial for a firm to transform resources to capture innovation opportunities and to achieve innovation output (e.g., Bantel & Jackson, 1989; Camelo et al., 2010).

Furthermore, due to family CEOs' strong identification with the firms, the job security they enjoy naturally fosters long-term commitment (Davis et al., 2010; Eddleston & Kellermanns, 2007). With a long-term orientation, family CEOs tend to initiate farsighted investments that may take the form of investing in people through on-the-job learning to create knowledge within the firm. Such practices can enrich managers' intra-firm experience by encouraging their intra-firm exploration of a broader array of tasks (Miller & Le Breton-Miller, 2006). Compared to their professional counterparts, family CEOs usually have more firm-specific knowledge and a clearer vision due to their high involvement in the firm (Carney, 2005). Family CEOs' better understanding of the firm, and their salient managerial discretion, enable them to promote managers to the appropriate positions and to enrich their intra-firm career experiences. Taken together, family CEOs are superior at encouraging TMT members' on-the-job learning and increasing TMT members' tacit knowledge of the firm through a variety of intrafirm career arrangements for these TMT members. Such intra-firm experiences help to increase TMT members' understanding of routines across functional departments and to enhance cross-functional coordination, which are critical for transforming resources to innovation outputs within the firm.

In summary, this section argues that, in addition to firm-level consequences (i.e., firm innovation), CEO type has an impact on internally-linked TMT managerial resource configuration during TMT members' retention in firms. Family CEOs tend to create

idiosyncratic resource configurations in firms, which are denoted as familiness and take the form of TMT members' diverse tenure and intrafirm career variety. Such TMT managerial resource configurations have firm-level outcomes such as effective strategy implementation and resource integration (Gupta, 1984). Because the essence of firm innovation can be viewed as resource (re)combination and integration (Cohen & Levinthal, 1990), internally-linked TMT resources, such as a diverse tenure and intrafirm career variety, can lead to superior innovation output. Thus, this research hypothesizes that internally-linked TMT resources mediate the positive relationship between family CEOs and firm innovation output.

*H4: Internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety) partially mediate the relationship between the presence of a family CEO and innovation output, such that a family-CEO-managed firm has higher levels of internally-linked TMT resources than one that is professionally managed, with these TMT resources being positively related to innovation output.*

*Family involvement in TMTs.* Now that the relationships between the presence of family CEOs, TMT resources, and firm innovation have been proposed, the extent to which family is involved in TMTs will be examined to assess the degree to which family involvement in TMTs influences family CEOs' configuration of TMT resources. First, high levels of family involvement in management may lead to less diverse organizational experiences, cognitive capabilities, and social connections within the TMT due to family members' similar background. In addition, with the presence of family CEOs, the appointment of family members to top management positions is usually regarded as the consequence of asymmetric altruism (Schulze et al., 2001, 2003). Family involvement in

both the selection of a CEO and TMT members strengthens families' intentions to preserve the control of the firm within the family (Berrone et al., 2012), leading to the desire of transgenerational succession. Such intentions erode the attractiveness of firms in the eyes of competent managers. As a consequence, family involvement in TMTs has an impact on the recruitment process for the latter, such that firms are less likely to recruit skilled members with substantial and diverse career experiences. Given the negative relationship between family CEOs and externally-linked TMT resources, as proposed in Hypothesis 3, this section hypothesizes that family involvement in TMTs strengthens this negative association.

> *H5: Family involvement in the TMT strengthens the relationship between the presence of a family CEO and externally-linked TMT resources (i.e., prior organizational experiences and external connections), such that the relationship is more negative when family members are involved in the TMT.*

The presence of family ties in TMTs also influences interactions among TMT members (Ensley & Pearson, 2005; Long & Mathews, 2011). Family business studies suggest that high levels of family involvement foreshow the use of generalized social exchange systems, which underpin interactions within firms' dominant coalitions (Long & Mathews, 2011). In contrast to restricted exchange systems that assume individuals are self-interested and egoistic, their generalized counterparts draw on the self-actualizing assumption of mankind and elicit reciprocal and altruistic behaviors within firms (Ekeh, 1974; Long & Mathews, 2011). At the extreme end in which firms are purely dominated by coalitions of family members, interactions therein are more likely to be guided by the

generalized model, which nurtures mutual trust, strong social capital, and altruistic behavior (Long, 2011; Long & Mathews, 2011).

Family involvement in TMTs tend to influence the extent to which generalized exchange systems are used to guide interactions therein. Because the presence of such systems has positive consequences for TMT interactions, such as cohesion, enhanced trust, improved cooperation, and stronger relationships (Long & Mathews, 2011), as well as effective on-the-job learning and firm-specific knowledge gaining. Such outcomes are more likely to exist during capable top managers' tenure in firms, rather than in the process of TMT recruitment. Given the presence of family CEOs, family involvement in TMTs, by encouraging the use of such exchange systems in firms' dominant coalitions, may lead to prolonged firm tenure and diversified intrafirm career experiences of capable TMT member. However, family involvement in TMTs also may increase top management change caused by the leave of incapable top managers, leading to more diverse TMTs in terms of firm tenure and team tenure. Thus, this section hypothesizes that family involvement in TMTs strengthens the positive relationship between family CEO and internally-linked TMT resources.

*H6: Family involvement in the TMT strengthens the relationship between the presence of a family CEO and internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety), such that the relationship is more positive when family members are involved in the TMT.*

### 3.4 Family CEOs' Orchestration of TMT Resources and Firm Innovation

CEOs' orchestration of TMT resources is the process through which they, acting like orchestra conductors, elicit harmonious performances from TMT members and

integrate their specialized knowledge to achieve enhanced outcomes (Kor & Mesko, 2013). This concept is borrowed from conceptual work on resource orchestration (Sirmon et al., 2011) and asset orchestration (Helfat et al., 2009), which are employed to describe how managers effectively utilize firm resources and capabilities to achieve firm-level results. According to these studies, although each action and resource is important, it is the synchronization of actions and/or complementarities of resources that are critical to firm value creation. Similar to managers' roles in asset orchestration, the CEO's orchestration of TMT resources has firm-level consequences (Kor & Mesko, 2013). For instance, CEOs can improve firm innovation by increasing cognitive conflicts and decreasing affective conflicts within TMTs; while both types of conflicts are associated with TMT diversity, the former is beneficial to the creation of newness and the latter is detrimental to its implementation (Certo et al., 2006; Nielsen, 2010). During this orchestration process, family CEOs interact with TMT members and the group-level integrations can give rise to firm-level consequences in terms of innovation input and output.

Similar to asset orchestration, the effectiveness of the CEO's orchestration of TMT resources depends on several mechanisms; these mechanisms have distinctive impact on firm innovation input and output in family-CEO-managed firms compared to professional-CEO-managed firms. First, family CEOs tend to create an effective common language within the TMT, which helps to enhance knowledge-sharing activities and increase knowledge integration. Second, family firms are usually described as high-trust organizations (Jones, 1983), which are primarily observed between a family CEO and the TMT members (Cruz, Gómez-Mejía, & Becerra, 2010; Miller & Le Breton-Miller, 2006).

Third, family CEOs tend to coordinate TMT members internal activities effectively due to the use of generalized exchange systems. The tendency of these CEOs to use generalized exchange systems to guide interactions within TMTs not only has group-level consequences, such as TMT cohesion and integration, but may also yield firm-level outcomes (Long & Mathews, 2011). Concerning firm innovation, family CEOs increase cohesion within TMTs, allowing firms to achieve efficient coordination; further, cohesion within TMTs—as one result of such systems—can mitigate the negative effects (e.g., affective conflicts) and enhance the positive results (e.g., cognitive conflicts) of their diversity (Certo et al., 2006). As a consequence, compared to professional CEOs, family CEOs orchestrate TMT resources uniquely and have a positive moderating impact on the TMT resource–firm innovation relationship thus contributing to both innovation input and output.

In summary, this section argues that family CEOs orchestrate TMT managerial resources distinctively, so that, given the endowments (constraints) of these resources, family CEO-managed firms achieve more in terms of both innovation input and output. Since family CEOs tend to develop a common language among the TMT, nurture a strong high-trust organizational culture, and use a generalized exchange system, the firms can adapt to changing environments rapidly and effectively, thus achieving higher levels of outcomes in terms of innovation input and output (Zahra, Hayton, & Salvato, 2004). This research hypothesizes that family CEOs moderate the relationship between TMT managerial resources and firm innovation.

*H7: A family CEO positively moderates the relationship between externally-linked TMT resources (i.e., prior organizational experiences and external connections) and innovation input.*

*H8: A family CEO positively moderates the relationship between internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety) and innovation output.*

## 3.5 Chapter Summary

Drawing on the family business literature reviewed in Chapter II and utilizing a capability-based perspective of firm innovation presented in the same chapter, this chapter develops a series of hypotheses to explore the role of family CEOs in firm innovation. This research hypothesizes that, in addition to the direct impact on firm innovation, family CEOs configure and orchestrate TMT resources distinctively, such that (a) TMT resources mediate the relationship between family CEOs and firm innovation and (b) family CEOs moderate the relationship between TMT resources and firm innovation. Chapter IV describes the methodology to be employed, including a description of the sample and variables, as well as specifying the models. These hypotheses are tested and results are presented in Chapter IV.

# CHAPTER IV

# METHODOLOGY, ANALYSIS AND RESULTS

The purpose of this chapter is to provide a comprehensive review of methodology, statistical analyses, empirical results, and *post hoc* tests of this research. A general overview of methodology is provided first, followed by a description of the data analysis. Building from the hypotheses introduced in Chapter III, this chapter presents the results from testing the hypothesized relationships in the research model and from additional *post-hoc* tests. The results presented in this chapter will provide the foundation for an integrated discussion of the effects of family CEOs on firm innovation in Chapter V. This chapter is organized into the follow sections: (4.1) methodology, (4.2) descriptive statistics, (4.3) empirical results, (4.4) *post hoc* tests, and (4.5) chapter summary.

## 4.1 Methodology

### 4.1.1 Sample

This research drew its sample from publicly traded firms in high-technology industries that are listed on the United States stock markets. The definition of a high-technology industry comes from the AeA, the largest association of high-tech companies in the U.S., which has been used in prior studies on firm innovation (e.g., Gómez-Mejía et al., 2014; Li et al., 2008). AeA delineates two broad high-technology categories: high-technology manufacturing (three digit SIC codes 357, 365, 366, 367, 381, 382, 384 and

386) and high-technology services (three digit SIC codes 481, 482, 484, 489 and 737). To control the variation caused by different innovation input and/or output patterns between manufacturing and service industries, this research draws on this categorization and focuses on high-technology manufacturing industries. Firms in these industries are ideal for research into firm innovation, as their survival and profitability are critically dependent on their ability to create and commercialize innovations quickly and efficiently.

Following prior studies on top management and firm innovation (e.g., Crossland et al., 2014; Gómez-Mejía et al., 2014; Nielsen & Nielsen, 2013), the analysis period spans five years, from 2010 to 2014. A five-year analysis period allows sufficient time for the researcher to observe both TMT resource configuration changes (e.g., Crossland et al., 2014; Nielsen & Nielsen, 2013) and firm innovation patterns (Gómez-Mejía et al., 2014). Applying this analysis period (2010-2014), this research identified 893 high-technology manufacturing companies publicly trading in the U.S. stock market. After the removal of inactive companies, non-U.S.-based companies, and companies for which R&D data are unavailable, 425 high-technology manufacturing companies remained in the sample pool.

The sample size of prior studies exploring CEO career and TMT characteristics generally ranges from 150 to 250 (e.g., Crossland et al., 2014; Nielsen & Nielsen, 2013). A preliminary power analysis indicates that, assuming that an effect size ranges between 0.1 and 0.2 with the *p*-value at 0.05, a sample size ranging between 2063 and 523 can decrease the probability of Type II error to 0.1. Thus, a sample size of 250 firms with a five-year analysis period can generate about 1250 observations, fitting in the above-

mentioned range of sample size. This research randomly selected 250 firms from the above-mentioned high-technology manufacturing industries that report R&D expenses in their annual report. The sample composition is listed in Table 4.1. Data were obtained from Compustat, firms' annual reports (10-K) and proxy statements (DEF 14A), and other sources such as Mergent Online and the company's website. A panel data set was constructed and used in this research to determine how family CEOs have a distinctive impact on firm innovation, as compared to their professional counterparts hired in family and nonfamily firms.

Table 4.1 Sample Composition: High-Technology Manufacturing Industries

| SIC | High-Technology Manufacturing Industries | # of randomly Selected Companies |
|---|---|---|
| 357 | Computer and office equipment | 34 |
| 365 | Household audio and video equipment | 5 |
| 366 | Communication equipment | 22 |
| 367 | Electronic components and accessories | 75 |
| 381 | Search and navigation equipment | 4 |
| 382 | Measuring and controlling devices | 36 |
| 384 | Medical instruments and supplies | 74 |
| 386 | Photographic equipment and supplies | 0 |
| Total | | 250 |

### 4.1.2 Measures

#### 4.1.2.1 Dependent Variable

Firm innovation is the dependent variable in this research. By employing a firm innovation input-output model, this research measured *innovation input* and *innovation output* separately. Following prior studies (e.g., Block, 2012; Balkin, Markman, & Gómez-Mejía, 2000; Latham & Braun, 2009), this research used the natural logarithm of R&D spending in year *t* as a proxy for *innovation input*. Sales are a proximal output of R&D (e.g., Patel & Chrisman, 2014) and sales of innovative products are used as a

measure of innovation output in prior studies (e.g., Brouwer & Kleinknecht, 1999; Faber & Hessen, 2004). This research focuses on high-technology firms, in which innovative products account for total sales to a great extent. In addition, innovation in these firms takes the form of product innovation and process innovation, both of which can contribute to firm sales. Thus in this research, the natural logarithm of total sales in year *t* was used as a proxy for *innovation output*.

#### 4.1.2.2 Independent Variable

*Family CEO* is the independent variable in this research and is measured as a binary variable (Minichilli et al., 2010). This research used two steps to code *family CEO*. First, all the sample firms were identified as family or non-family firms. Family firms were identified based on family involvement in ownership and management (e.g., Anderson & Reeb, 2003; Chrisman & Patel, 2012; Gómez-Mejía et al., 2010; Villalonga & Amit, 2006). The following criteria were applied in this first step: (1) a family owns 5% or more of the firm's stock and (2) at least one family member (a person related by blood or marriage to the owning family) is involved in the TMT. For instance, a firm was identified as a family firm when the brother(s), the spouse, or a later generation of the founder is involved in the TMT but the family owns at least 5% of the firm's stock. The information about family relationships among directors and executive officers can be found in a firm's annual reports and/or proxy statements. For non-family firms, *family CEO* was coded as "0". Second, for a family firm, when a member of the owning family (i.e., a person related by blood or by marriage to the owning family) holds the CEO position of the firm, *family CEO* was coded as "1"; otherwise, f*amily CEO* was coded as "0".

#### 4.1.2.3 Mediator and Moderator Variables

TMT has been defined in various ways in previous literature (e.g., Certo et al., 2006). Following prior studies (e.g., Crossland et al., 2014), this research distinguished CEO from other TMT members and defined TMT as the group of top executives holding the non-CEO senior management positions, such as President, Chief Operational Officer (COO), Chief Financial Officer (CFO), Executive Vice President (EVP), Senior Vice President (SVP), and General Vice President (GVP), which are listed in 10-K filings and proxy statements. *Family involvement in TMT* was measured by counting the number of family members involved in the TMT (Minichilli et al., 2010).

TMT members' managerial resources were measured based on a manual data collection process. Multiple sources were used for data collection, including proxy statements (DEF 14A) filed with the Securities and Exchange Commission (SEC), corporate histories extracted from the company's website, and/or through Internet search. A two-step process was used for TMT managerial resource data collection. The first step included the data collection of each individual TMT members' managerial resources. The choice of the measures of these resources primarily drew on the method used in Crossland et al. (2014) and Certo et al. (2006). For proxies of externally-linked TMT resources, *external connections* were measured as the sum of current organizational titles (e.g., directorship in other firms) that an individual has outside the firm, and *prior organizational experiences* were measured as the sum of organizations that an individual worked for, as a TMT member, before joining the focal firm. For proxies of internally-linked TMT resources, *firm tenure* was measured as the number of years that have elapsed since an individual joined the firm, *team tenure* was measured as the number of

years since an individual was included in the TMT, and *intrafirm career variety* was measured as the sum of top managerial positions that an individual has experienced within the firm.

The second step of data collection generated group-level measures. Prior studies typically use the amount (e.g., the sum or the average) or the diversity of TMT managerial resources for group-level measures (e.g., Bantel & Jackson, 1989; Certo et al., 2006; Chen et al., 2010; Kor, 2006; Young et al., 2001). This research chose the amount-approach to calculate *external connections, prior organizational experiences,* and *intrafirm career variety*. The reason for choosing the amount-approach is that the individual-level measure for these three variables reflects the accumulation of intra-personal knowledge and/or the gained experience variety. For instance, *external connections* and *prior organizational experiences* reflect a top manager's boundaryless career experiences across firms (DeFillippi & Arthur, 1994; O'Mahony & Bechky, 2006); the more these externally-linked resources are possessed by a firm, the better the firm recognizes innovation opportunities. This research sums individual-level *external connections* and *prior organizational experiences* to have the group-level measures. The measure of individual-level *intrafirm career variety* reflects a top manager's intra-personal knowledge and expertise gained through vertical and hierarchical moves within the firm; thus, the average of individual-level *intrafirm career variety* is calculated as the group-level measure of this variable. Prior studies suggest that TMT diversity is a promising measure for group-level attributes, especially for TMT *firm tenure* and *team tenure* (e.g., Banel & Jackson, 1989; Certo et al., 2006). Following prior studies, this research calculated the coefficient of variation (standard deviation divided by the mean)

as the measure of the diversity of TMT *firm tenure* and *team tenure* (Allison, 1978; Carpenter, 2002; Crossland et al., 2014).

#### 4.1.2.4 Control Variables

This research used a number of control variables, which can be categorized into three sets. The first set of control variables includes (1) *family ownership*, measured as the percentage of overall ownership held by the family for family firms and 0 for non-family firms, (2) *firm size,* measured as the natural logarithm of the firm's total equity lagged at $t - 1$, (3) *firm performance,* measured as return on assets (ROA) lagged at $t - 1$, (4) *firm age,* measured as the current year minus the year of the firm's founding, (5) *managerial ownership,* measured as the percentage of overall ownership held by the CEO. These variables are widely used in studies in which firm-level outcomes (e.g., Chrisman & Patel, 2012; Gómez-Mejía et al., 2014) and TMT composition characteristics (e.g., Nielsen & Nielsen, 2013) are the dependent variables of the model. Following prior literature, this research included these variables in all the testing models.

The second set of control variables are those widely used in models when firm innovation input and output are the dependent variables (e.g., Block, 2012; Chrisman & Patel, 2012; Gómez-Mejía et al., 2014). This set of control variables includes (1) organizational slack lagged at $t - 1$, which consists of *absorbed slack*, measured as the assets/liability ratio, *potential slack,* measured as the debt/equity ratio, *unabsorbed slack*, measured as the ratio of current assets to current liabilities, and (2) *sales growth*, measured as the average rate of sales growth over the last three years.

This research controlled the variables critical to TMT characteristics (e.g., Nielsen & Nielsen, 2013) when TMT resource configuration is the dependent variable. This set of

control variables includes (1) *board independence*, measured as the percentage of independent directors on board, (2) *CEO educational background*, measured as "1" when the CEO's educational background is primarily related to natural science and engineering, "2" when the CEO's educational background is primarily related to business and management, and "3" when the CEO's educational background is primarily related to other disciplines such as psychology and law, (3) *CEO firm tenure*, measured as the number of years that have elapsed since the CEO joined the firm, (4) *CEO duality*, measured as "0" when the CEO did not take any dual role, "1" when the CEO was also either the Chairperson or the President of the company, and "2" when the CEO is also both the Chairperson and the President of the company, (5) CEO managerial resource variables (i.e., *CEO prior organizational experiences, CEO external connections, CEO tenure, and CEO intrafirm career variety*). The reason for controlling CEO managerial resource variables is based on the fact that the CEO, assuming a critical role of configuring TMT competencies (Kor & Mesko, 2013), was not included in the calculation of team-level TMT resource variables (i.e., *prior organizational experiences, external connections, firm tenure, team tenure, and intrafirm career variety*) in this research. Thus, this research controlled the respective variables for CEO when the TMT managerial resource variables were the dependent variables in a model.

A summary of variables and measures is presented in Table 4.2.

Table 4.2 Summary of Variables and Measures

| Variable | Measure/Description |
|---|---|
| **Dependent variable** | |
| *Innovation input* | Natural logarithm of R&D spending |
| *Innovation output* | Natural logarithm of total sales |
| **Independent variable** | |
| *Family CEO* | A binary variable (1, if a family member takes the CEO position of the firm; 0, otherwise) |
| **Mediator (TMT managerial resources)** | |
| *External connections* | Sum of TMT members' current directorship and/or other connections outside the firm |
| *Prior organizational experiences* | Sum of organizations that TMT members were hired as a top manager before joining the firm |
| *Firm tenure* | Coefficient of variation of TMT members' firm tenure |
| *Team tenure* | Coefficient of variation of TMT members' team tenure |
| *Intrafirm career variety* | Average of TMT members' managerial positions held within the firm |
| **Moderator** | |
| *Family involvement in TMT* | Number of family members in the TMT |
| **Control variables** | |
| *Family ownership* | Percentage of shares owned by the family |
| *Firm size* | Natural logarithm of a firm's one year lagged total assets |
| *Firm performance* | One year lagged return on total assets (ROA) |
| *Firm age* | Number of years elapsed since a firm's founding |
| *Managerial ownership* | Percentage of shares owned by the CEO |
| *Absorbed slack* | One year lagged assets/liability ratio |
| *Potential slack* | One year lagged debt/equity ratio |
| *Unabsorbed slack* | One year lagged ratio of current assets/current liabilities |
| *Sales growth* | Average of the percentage of sales growth over the last three years |
| *Board independence* | Percentage of independent directors on board |
| *CEO educational background* | A categorical variable (1, if the CEO's educational background is primarily related to science and engineering; 2, if the CEO's educational background is primarily related to business and management; 0, otherwise) |
| *CEO firm tenure* | Count of the years since the CEO joined the firm |
| *CEO duality* | A categorical variable (1, if the CEO also holds the Chairperson or the President position; 2, if the CEO also holds the Chairperson position and the President position; 0, otherwise) |

## 4.2 Descriptive statistics

Descriptive statistics are provided in Table 4.3. In general, 24% of the sample is family-CEO-managed firms. Specifically, 41% of the sample is family firms, in which

62% are managed by a family CEO. These numbers are consistent with prior family business studies using publicly traded firms as the sample (Block, 2012; Chrisman & Patel, 2012). On average, these firms have been in business for 31.04 years. The mean of innovation input and innovation output is lower in family-CEO-managed firms, as compared to professional-CEO-managed family and non-family firms. The mean of externally-linked TMT resources (i.e., TMT external connections and TMT prior organizational experiences) in family-CEO-managed firms is higher than those in professional-CEO-managed family firms but lower than those in their nonfamily counterparts. The mean of internally-linked TMT resources (i.e., TMT firm tenure, TMT team tenure, and TMT intra-firm career variety) in family-CEO-managed firms is lower than professional-CEO managed family and non-family firms.

Table 4.3 Means and Standard Deviations of Variables

| | ALL Sample | | Family-CEO-Managed Firm | | Professional-CEO-Managed Family Firm | | Nonfamily Firm | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. | Mean | Std. | Mean | Std. | Mean | Std. |
| Innovation input | 2.85 | 2.34 | 1.54 | 2.07 | 1.67 | 1.82 | 3.78 | 2.17 |
| Innovation output | 5.03 | 2.59 | 3.83 | 2.01 | 3.90 | 1.80 | 6.01 | 2.57 |
| Family CEO | 0.24 | 0.43 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| TMT external connections | 0.61 | 1.80 | 0.42 | 1.39 | 0.25 | 0.93 | 0.83 | 2.13 |
| TMT prior org experiences | 10.16 | 7.95 | 7.38 | 5.07 | 7.30 | 6.41 | 11.88 | 8.41 |
| TMT firm tenure | 0.60 | 0.28 | 0.52 | 0.27 | 0.59 | 0.31 | 0.63 | 0.28 |
| TMT team tenure | 0.70 | 0.28 | 0.52 | 0.30 | 0.57 | 0.28 | 0.62 | 0.27 |
| TMT intrafirm career variety | 2.61 | 0.95 | 2.36 | 0.96 | 2.67 | 0.79 | 2.70 | 0.95 |
| Family involvement in TMT | 0.05 | 0.24 | 0.13 | 0.33 | 0.08 | 0.34 | 0.00 | 0.07 |
| Family ownership | 9.52 | 17.39 | 25.29 | 22.56 | 19.57 | 16.43 | 0.07 | 0.89 |
| Firm size | 4.98 | 2.33 | 3.89 | 1.74 | 3.81 | 1.88 | 5.79 | 2.32 |
| Performance | -42.10 | 271.83 | -80.95 | 463.78 | -51.13 | 285.76 | -20.67 | 126.99 |
| Firm age | 31.04 | 21.58 | 27.38 | 17.81 | 37.12 | 25.25 | 32.05 | 22.14 |
| Managerial ownership | 6.76 | 13.38 | 21.68 | 20.56 | 3.00 | 3.41 | 1.62 | 1.62 |
| Absorbed slack | 111.31 | 576.04 | 74.00 | 170.89 | 100.06 | 328.62 | 130.45 | 737.77 |
| Potential slack | 45.51 | 415.57 | 19.15 | 484.46 | 11.06 | 514.56 | 64.86 | 359.32 |
| Unabsorbed Slack | 4.19 | 4.44 | 3.66 | 3.11 | 5.45 | 5.64 | 4.03 | 4.56 |
| Sales growth | 20.28 | 135.04 | 13.51 | 80.40 | 11.14 | 38.96 | 22.55 | 161.43 |
| Board independence | 74.89 | 15.64 | 65.97 | 16.75 | 68.46 | 16.68 | 80.27 | 12.51 |
| CEO educational background | 1.42 | 0.74 | 1.27 | 0.67 | 1.58 | 0.75 | 1.43 | 0.76 |
| CEO firm tenure | 13.43 | 10.35 | 19.31 | 11.59 | 12.09 | 10.77 | 11.54 | 8.56 |
| CEO duality | 1.16 | 0.57 | 1.42 | 0.64 | 0.97 | 0.54 | 1.11 | 0.51 |
| CEO tenure | 9.26 | 8.36 | 15.88 | 10.72 | 6.57 | 6.26 | 7.24 | 5.71 |
| CEO external connections | 0.66 | 1.14 | 0.43 | 0.90 | 0.40 | 0.92 | 0.84 | 1.27 |
| CEO prior org experiences | 2.22 | 1.89 | 1.89 | 2.03 | 2.07 | 1.79 | 2.33 | 1.83 |
| CEO intrafirm career variety | 3.47 | 2.13 | 3.34 | 2.63 | 3.60 | 1.67 | 3.54 | 2.04 |
| Observations | 1092 | | 278 | | 172 | | 642 | |

The correlation matrix is provided in Table 4.4. Family CEO is negatively correlated with firm innovation input, innovation output, and all proxies of externally-linked and internally-linked TMT resources. TMT external connections, TMT prior organizational experiences, and TMT intrafirm career variety are positively correlated with both innovation input and innovation output.

Concerning the correlation between family CEO and control variables, family CEO is positively correlated with CEO firm tenure, CEO tenure, CEO duality, family ownership and managerial ownership, while the correlation between family CEO and

other control variables, such as board independence, firm performance, firm age and unabsorbed slack, is negatively significant.

Concerning the correlation between firm innovation and control variables, CEO external connections, CEO intrafirm career variety, board independence, firm size, firm performance, firm age, potential slack are positively correlated with firm innovation input and innovation output. Managerial ownership, family ownership, absorbed slack and unabsorbed slack are negatively correlated with innovation input and innovation output. While CEO tenure is negatively correlated with innovation input, the correlation between CEO firm tenure and innovation output is positive.

Concerning the correlation between TMT resource variables and control variables, TMT external connections are positively correlated with CEO external connections. TMT prior organizational experiences are positively correlated with CEO prior organizational experiences. TMT intrafirm career variety is positively correlated with CEO intrafirm career variety. CEO firm tenure is negatively correlated with TMT firm tenure, while CEO tenure is negatively correlated with TMT team tenure.

Among control variables, family ownership is negatively correlated with TMT resources (i.e., TMT prior organizational experiences, firm tenure, team tenure, and intra-firm career variety) and CEO resources (i.e., CEO external connections and intra-firm career variety). The correlation between family ownership and family involvement in TMT is positive; such positive correlation is also observed between family ownership and several CEO-related variables, such as CEO (firm) tenure and CEO duality. The highest variance inflation (VIF) estimated in conjunction with hierarchical regression model is 4.85, indicating the concern for multicollinearity is very low in this study.

Table 4.4 Descriptive Statistics and Correlations

| | Mean | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1 Innovation input | 2.85 | 1.00 | | | | | | | |
| 2 Innovation output | 5.03 | 0.84*** | 1.00 | | | | | | |
| 3 Family CEO | 0.24 | -0.32*** | -0.27*** | 1.00 | | | | | |
| 4 TMT external connections | 0.61 | 0.20*** | 0.16*** | -0.06* | 1.00 | | | | |
| 5 TMT prior org experiences | 10.16 | 0.36*** | 0.24*** | -0.20*** | 0.13*** | 1.00 | | | |
| 6 TMT firm tenure | 0.60 | 0.02 | -0.01 | -0.14*** | 0.05 | 0.25*** | 1.00 | | |
| 7 TMT team tenure | 0.70 | 0.11*** | 0.02 | -0.14*** | -0.01 | 0.18*** | 0.57*** | 1.00 | |
| 8 TMT intrafirm career variety | 2.61 | 0.21*** | 0.23*** | -0.15*** | 0.20*** | -0.10*** | -0.11** | 0.02 | 1.00 |
| 9 Family involvement in TMT | 0.05 | -0.08** | -0.04 | 0.19*** | -0.01 | -0.04 | 0.00 | -0.02 | -0.02 |
| 10 CEO educational background | 1.42 | -0.20*** | -0.06 | -0.12** | 0.08† | -0.05 | 0.04 | -0.03 | 0.00 |
| 11 CEO firm tenure | 13.43 | 0.01 | 0.12*** | 0.32*** | -0.07* | -0.27*** | -0.19*** | 0.00 | 0.14*** |
| 12 CEO tenure | 9.26 | -0.13*** | -0.03 | 0.45*** | -0.10*** | -0.15*** | -0.15*** | -0.06† | -0.02 |
| 13 CEO duality | 1.16 | 0.00 | 0.04 | 0.26*** | -0.02 | -0.11*** | -0.07* | -0.05† | 0.01 |
| 14 CEO external connections | 0.66 | 0.26*** | 0.28*** | -0.11*** | 0.13*** | 0.11*** | 0.00 | 0.01 | 0.19*** |
| 15 CEO prior org experiences | 2.22 | -0.01 | -0.09** | -0.10** | 0.01 | 0.32*** | 0.17*** | 0.07* | -0.01 |
| 16 CEO intrafirm career variety | 3.47 | 0.18*** | 0.25*** | -0.03 | -0.04 | -0.13*** | -0.09** | -0.04 | 0.24*** |
| 17 Managerial ownership | 6.76 | -0.35*** | -0.25*** | 0.64*** | 0.03 | -0.14*** | -0.09** | -0.17*** | -0.15*** |
| 18 Board independence | 74.89 | 0.47*** | 0.39*** | -0.32*** | -0.09** | 0.20*** | 0.08* | 0.10** | 0.07* |
| 19 Family ownership | 9.52 | -0.41*** | -0.28*** | 0.53*** | -0.02 | -0.19*** | -0.08* | -0.18*** | -0.15*** |
| 20 Firm size | 3.85 | 0.77*** | 0.86*** | 0.02 | -0.01 | 0.29*** | -0.05 | 0.09 | 0.15** |
| 21 Performance | -42.1 | 0.17*** | 0.24*** | -0.08** | -0.02 | 0.09** | 0.01 | -0.09** | 0.05 |
| 22 Firm age | 31.04 | 0.09** | 0.23*** | -0.10*** | -0.06* | -0.21*** | 0.06* | 0.04 | 0.24*** |
| 23 Absorbed slack | 111.3 | -0.11*** | -0.27*** | -0.04 | 0.02 | -0.02 | 0.01 | 0.05 | 0.06* |
| 24 Potential slack | 45.51 | 0.09** | 0.13*** | -0.03 | 0.01 | 0.03 | 0.03 | 0.01 | -0.04 |
| 25 Unabsorbed slack | 4.19 | -0.09** | -0.18*** | -0.07* | -0.01 | 0.00 | -0.01 | 0.05 | -0.01 |
| 26 Sales growth | 20.28 | 0.01 | -0.07* | -0.03 | 0.08** | 0.06* | 0.00 | 0.03 | -0.06† |

Table 4.4 (Continued)

| | Mean | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 Family involvement in TMT | 0.05 | 1.00 | | | | | | | | |
| 10 CEO educational background | 1.42 | 0.12** | 1.00 | | | | | | | |
| 11 CEO firm tenure | 13.43 | 0.13*** | -0.05 | 1.00 | | | | | | |
| 12 CEO tenure | 9.26 | 0.19*** | -0.14*** | 0.75*** | 1.00 | | | | | |
| 13 CEO duality | 1.16 | 0.05† | -0.09* | 0.21*** | 0.27*** | 1.00 | | | | |
| 14 CEO external connections | 0.66 | 0.06† | 0.03 | -0.03 | -0.07* | 0.04 | 1.00 | | | |
| 15 CEO prior org experiences | 2.22 | 0.04 | -0.05 | -0.49*** | -0.28*** | -0.09** | 0.05† | 1.00 | | |
| 16 CEO intrafirm career variety | 3.47 | -0.04 | 0.08† | 0.33*** | 0.06† | 0.23*** | 0.11*** | -0.34*** | 1.00 | |
| 17 Managerial ownership | 6.76 | 0.12*** | -0.02 | 0.20*** | 0.34*** | 0.20*** | -0.06* | -0.16*** | -0.04 | 1.00 |
| 18 Board independence | 74.89 | -0.08** | -0.13*** | -0.01 | -0.07* | -0.04 | 0.13*** | 0.00 | 0.05 | -0.37*** |
| 19 Family ownership | 9.52 | 0.19*** | -0.03 | 0.18*** | 0.27*** | 0.12*** | -0.12*** | -0.17*** | -0.02 | 0.79*** |
| 20 Firm size | 3.85 | 0.05 | -0.26*** | 0.15** | 0.11* | 0.02 | 0.15** | -0.13** | 0.16** | -0.14** |
| 21 Performance | -42.1 | 0.01 | 0.00 | 0.09** | 0.07* | 0.05 | 0.02 | -0.16*** | 0.06† | -0.04 |
| 22 Firm age | 31.04 | -0.05† | 0.03 | 0.30*** | 0.07* | 0.14*** | 0.10*** | -0.26*** | 0.23*** | -0.12*** |
| 23 Absorbed slack | 111.3 | -0.02 | 0.00 | -0.07* | -0.04 | -0.02 | -0.02 | -0.03 | -0.03 | -0.03 |
| 24 Potential slack | 45.51 | 0.01 | -0.06 | 0.02 | 0.05† | 0.01 | 0.02 | 0.01 | 0.03 | -0.02 |
| 25 Unabsorbed slack | 4.19 | -0.05† | 0.02 | 0.05† | 0.11*** | 0.03 | -0.08** | -0.13*** | -0.05 | -0.04 |
| 26 Sales growth | 20.28 | -0.01 | 0.01 | -0.10** | -0.07* | -0.01 | 0.03 | 0.00 | -0.05 | -0.04 |
| | Mean | 22 | 23 | 24 | 25 | 26 | 23 | 24 | 25 | 26 |
| 18 Board independence | 74.89 | 1.00 | | | | | | | | |
| 19 Family ownership | 9.52 | -0.47*** | 1.00 | | | | | | | |
| 20 Firm size | 3.85 | 0.19*** | -0.13* | 1.00 | | | | | | |
| 21 Performance | -42.1 | 0.29*** | -0.02 | 0.39*** | 1.00 | | | | | |
| 22 Firm age | 31.04 | 0.20*** | -0.04 | -0.06 | 0.09** | 1.00 | | | | |
| 23 Absorbed slack | 111.3 | -0.07* | -0.04 | -0.14** | -0.15*** | -0.09** | 1.00 | | | |
| 24 Potential slack | 45.51 | 0.10*** | -0.02 | -0.33*** | 0.08* | 0.03 | -0.03 | 1.00 | | |
| 25 Unabsorbed slack | 4.19 | 0.03 | 0.02 | 0.07 | 0.10*** | -0.02 | 0.24*** | -0.01*** | 1.00 | |
| 26 Sales growth | 20.28 | 0.03 | -0.05† | 0.09† | -0.08** | -0.11*** | 0.39*** | -0.03*** | 0.27*** | 1.00 |

Note: ***p<0.001; **p<0.01; *p<0.05; † p<0.10

## 4.3 Empirical Results

The panel data structure usually does not meet the assumption of OLS regression (e.g., exogenous covariates, uncorrelated errors, and homoscedastic errors); thus, OLS regression may generate biased and inconsistent estimates (Hausman & Taylor, 1981). Generalized Least Squares (GLS) regression with fixed-effect (FE) or random-effect (RE) models is widely used to cure correlation and/or heteroscedastic error issues. This research used the Hausman test to specify whether a FE or RE regression model is appropriate (Judson & Owen, 1999). For all the hypothesis tests, Hausman test suggested the use of FE models. Durbin-Watson (DW) test was used to test potential error serial correlation for time serial data (Judson & Owen, 1999). Empirical results presented in this study are based on the use of Stata 13.0.

### 4.3.1 Direct Effect – CEO Type and Firm Innovation

This research hypothesizes that the presence of a family CEO has a direct impact on firm innovation input and innovation output (Hypothesis 1). This research used Models 1 and 2 in Table 4.5 to test Hypothesis 1. Model 1 included all control variables. In Model 1, firm size, firm age, managerial ownership, absorbed slack and potential slack were positively related to firm innovation input, indicating that the larger the firm size, the longer the firm age, the more managerial ownership, the more slack resources, the higher levels of innovation input a firm had. However, the relationship between managerial ownership and firm innovation input was nonlinear, indicated by the negative effect of the square item of managerial ownership. This nonlinear relationship is consistent with findings in prior studies, which suggest management retrenchment associated with high levels of managerial ownership (e.g., Morck et al., 1988).

Unabsorbed slack and sales growth were negatively related to innovation input. Model 2 regressed firm innovation input on family CEO and control variables. In Model 2, family CEO was negatively related to firm innovation input (β=-0.303, *p*-value=0.007), suggesting that a family-CEO-managed firm had less innovation input than a professional-CEO managed firm. Specifically, the empirical results indicate that, ceteris paribus, a family-CEO-managed firm invested 26% less in innovation input than a professional-CEO-managed firm ($e^{-0.303}$-1). Hypothesis 1 is supported.

In this research, the presence of a family CEO is hypothesized to have a positive direct impact on firm innovation output (Hypothesis 2). Model 3 in Table 4.5 regressed firm innovation output on control variables. In Model 3, firm size, firm performance, firm age, absorbed slack, and potential slack were positively related to firm innovation output. Unabsorbed slack was negatively related to innovation output. To test Hypothesis 2, Model 4 regressed firm innovation output on family CEO and control variables. Shown in Table 4.5, family CEO was positively related to firm innovation output (β=0.303, *p*-value=0.001). In support of Hypothesis 2, a family-CEO-managed firm had greater innovation output than a professional-CEO managed firm. The empirical results suggest that, given innovation input, a family-CEO-managed firm had 35% greater innovation output than a professional-CEO-managed firm ($e^{0.303}$-1).

Table 4.5 Family CEO and Firm Innovation: Direct Impact

| | Innovation Input | | Innovation Output | |
|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 |
| Intercept | -0.384 | -0.430 | 3.553*** | 3.611*** |
| | (0.266) | (0.266) | (0.227) | (0.226) |
| Family CEO | | -0.303** | | 0.303*** |
| | | (0.111) | | (0.092) |
| *Control variables:* | | | | |
| Log(R&D) | | | 0.033 | 0.037 |
| | | | (0.028) | (0.029) |
| Family ownership | 0.004 | 0.003 | -0.004 | -0.003 |
| | (0.006) | (0.006) | (0.005) | (0.005) |
| Firm size | 0.473*** | 0.484*** | 0.290*** | 0.278*** |
| | (0.038) | (0.038) | (0.035) | (0.035) |
| Performance | -0.0003 | -0.0003 | 0.001* | 0.001* |
| | (0.0008) | (0.0008) | (0.0007) | (0.0007) |
| Firm age | 0.031 | 0.031*** | 0.014** | -0.014* |
| | (0.007) | (0.007) | (0.006) | (0.006) |
| Managerial ownership | 0.027** | 0.045*** | 0.008 | -0.011 |
| | (0.010) | (0.012) | (0.008) | (0.010) |
| (Managerial ownership)$^2$ | -0.001*** | -0.001*** | -0.0003$^{\dagger}$ | -0.0001 |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Absorbed slack | 6.73E-05$^{\dagger}$ | 6.64E-05$^{\dagger}$ | 0.0001$^{\dagger}$ | 0.0002$^{\dagger}$ |
| | (3.65E-05) | (3.63E-05) | (8.03E-05) | (7.98E-05) |
| Potential slack | 0.001*** | 0.0006*** | 0.0003*** | 0.0002*** |
| | (8.07E-05) | (8.04E-05) | (6.99E-05) | (6.95E-05) |
| Unabsorbed slack | -0.011* | -0.012* | -0.036*** | -0.036*** |
| | (0.0054) | (0.005) | (0.005) | (0.005) |
| Sales growth | -0.0002* | -0.0002$^{\dagger}$ | -1.36E-05*** | -1.57E-05 |
| | (0.0001) | (0.0001) | (0.00001) | (0.0001) |
| Number of observations | 947 | 947 | 946 | 946 |
| Within $R^2$ | 0.285 | 0.293 | 0.242 | 0.254 |
| F-statistics | 28.83$^{***}$ | 27.12$^{***}$ | 20.93$^{***}$ | 20.36$^{***}$ |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

### 4.3.2 Configuration Effect – TMT Managerial Resources as Mediators

TMT managerial resources are hypothesized to partially mediate the relationship between family CEO and firm innovation (Hypothesis 3 and Hypothesis 4). This research followed a procedure outlined in Baron and Kenny (1986), which consists of three steps. First, this research regressed the dependent variable on the independent variable (shown

in Model 2 and Model 4 in Table 4.5); second, the mediator was regressed on the independent variable (i.e., family CEO); third, the dependent variable was regressed on both the mediator and independent variable. Model 5 through Model 7 in Table 4.6 were employed to test the partial mediation effect of externally-linked TMT resources on the relationship between family CEO and innovation input (Hypothesis 3). Model 8 through Model 11 in Table 4.7 were used to test the partial mediation effect of internally-linked TMT resources on the relationship between family CEO and innovation output (Hypothesis 4).

To test Hypothesis 3, the first step was shown in Model 2, Table 4.5. As the second step, this dissertation regressed two proxies of externally-linked TMT resources on family CEO and control variables, which was shown in Model 5 and Model 6 in Table 4.6. In Model 5, when TMT external connections was used as a proxy for externally-linked TMT resources, CEO duality had a significant positive effect on TMT external connections, while the CEO's own external connections and CEO firm tenure were negatively related to TMT external connections. Family CEO had a marginal negative effect (β=-0.594, *p*-value=0.081), indicating that a family-CEO-managed firm has less TMT external connections than a professional-CEO-managed firm. In Model 6, when TMT prior organizational experiences were used as a proxy of externally-linked TMT resources, firm size, firm age, and managerial ownership were positively related to externally-linked TMT resources. Family CEO had a marginal negative effect (β=-3.038, *p*-value=0.068), indicating that TMT members have fewer prior organizational experiences in a family-CEO-managed firm than in a professional-CEO-managed firm.

Model 7 in Table 4.6 regressed innovation input on family CEO, TMT external connections, TMT prior organizational experiences, and control variables. Consistent with Model 2, firm size, firm age, managerial ownership, absorbed slack and potential slack still remained a positive effect on firm innovation input, while potential slack had a negative effect. TMT external connections were positively associated with firm innovation input in Model 7 (β=0.032, *p*-value=0.067), while TMT prior organizational experiences did not have a significant effect. In Model 7, the effect of family CEO on firm innovation (β=-0.297, *p*-value=0.007) was decreased from -0.303 to -0.297 and the significance level had no change (*p*-value=0.007). Hypothesis 3 is supported by using TMT external connection as a proxy of externally-linked TMT resources. Put in a different way, externally-linked TMT resources (using TMT external connections as a proxy) partially mediates the negative relationship between family CEO and firm innovation input.

Table 4.6 Family CEO and Innovation Input: Externally-Linked TMT Resources as Mediator

| | TMT External Connections | TMT Prior Org Experiences | Innovation Input |
|---|---|---|---|
| | Model 5 | Model 6 | Model 7 |
| Intercept | -0.444 | -4.202 | 0.264 |
| | (0.926) | (4.541) | (0.269) |
| Family CEO | -0.594† | -3.038† | -0.297** |
| | (0.339) | (1.662) | (0.110) |
| TMT external connections | | | 0.032† |
| | | | (0.018) |
| TMT prior org experiences | | | 0.001 |
| | | | (0.003) |
| *Control variables:* | | | |
| Family ownership | 0.022 | -0.037 | -0.003 |
| | (0.021) | (0.102) | (0.006) |
| Firm size | -0.060 | 0.978* | 0.501*** |
| | (0.084) | (0.415) | (0.039) |
| Performance | 0.0009 | -0.008 | -0.0001 |
| | (0.002) | (0.010) | (0.0007) |
| Firm age | 0.039 | 0.286* | 0.025*** |
| | (0.025) | (0.124) | (0.007) |
| Managerial ownership | 0.075 | 0.572* | 0.052*** |
| | (0.047) | (0.231) | (0.012) |
| (Managerial ownership)$^2$ | -0.001 | -0.007 | -0.001*** |
| | (0.001) | (0.005) | (0.0002) |
| Absorbed slack | | | 8.68E-05* |
| | | | (3.67E-05) |
| Potential slack | | | 0.0006*** |
| | | | (7.93E-05) |
| Unabsorbed slack | | | -0.019** |
| | | | (0.006) |
| Sales growth | | | -0.0002 |
| | | | (0.0001) |
| Board independence | 0.004 | 0.014 | |
| | (0.005) | (0.025) | |
| CEO educational background | -0.176 | 0.208 | |
| | (0.143) | (0.695) | |
| CEO Firm tenure | -0.042*** | -0.078 | |
| | (0.013) | (0.066) | |
| CEO duality | 0.688*** | 0.563 | |
| | (0.154) | (0.690) | |
| CEO external connections | -0.183*** | | |
| | (0.065) | | |
| CEO prior org experiences | | 0.273 | |
| | | (0.227) | |
| Number of observations | 517 | 503 | 907 |
| Within $R^2$ | 0.089 | 0.060 | 0.298 |
| F-statistics | 3.06*** | 1.92* | 22.33*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

This research followed the same three-step procedure to test Hypothesis 4. The first step to test Hypotheses 4 is shown in Model 4 (Table 4.5). As the second step, Model 8 through Model 10 in Table 4.7 regressed three proxies of internally-linked TMT resources on family CEO and control variables. In Model 8, when TMT firm tenure was used as a proxy of internally-linked TMT resources, a negative association was found between family ownership and TMT firm tenure, indicating that the more family ownership, the lower levels of TMT firm tenure diversity. In Model 9, when TMT team tenure was used as a proxy of internally-linked TMT resources, firm performance and CEO duality had a negative effect on this internally-linked TMT resource, indicating that a TMT with more homogeneous team tenure was more likely to be found in a firm with better performance and CEO duality. In Model 10, family ownership, performance, and firm age were positively associated with TMT intrafirm career variety, while managerial ownership and CEO educational background had a negative effect. As shown in Model 8 through Model 10, family CEO did not have a significant effect on internally-linked TMT resources.

Model 11 in Table 4.7 regressed innovation output on family CEO, TMT firm tenure, TMT team tenure, and TMT intrafirm career variety. Consistent with Model 4, family CEO, firm size, firm age, and potential slack remained a positive effect on firm innovation output. However, a significant association between internally-linked TMT resources and innovation output was not found in Model 11. Hypothesis 4 is not supported.

Table 4.7 Family CEO and Innovation Output: Internally-Linked TMT Resources as Mediator

| | TMT Firm Tenure | TMT Team Tenure | TMT Intrafirm Career Variety | Innovation Output |
|---|---|---|---|---|
| | Model 8 | Model 9 | Model 10 | Model 11 |
| Intercept | 0.975*** | 1.002*** | 1.463** | 3.257*** |
| | (0.276) | (0.292) | (0.494) | (0.252) |
| Family CEO | 0.093 | -0.086 | -0.094 | 0.208* |
| | (0.105) | (0.108) | (0.173) | (0.102) |
| TMT firm tenure diversity | | | | 0.003 |
| | | | | (0.065) |
| TMT team tenure diversity | | | | 0.012 |
| | | | | (0.060) |
| TMT intrafirm career variety | | | | 0.003 |
| | | | | (0.028) |
| *Control variables:* | | | | |
| Log (R&D) | | | | 0.054 |
| | | | | (0.038) |
| Family ownership | -0.017** | -0.009 | 0.032** | -3.13E-05 |
| | (0.006) | (0.006) | (0.011) | (0.005) |
| Firm size | -7.36E-04 | 0.006 | 0.006 | 0.356*** |
| | (0.027) | (0.028) | (0.043) | (0.041) |
| Performance | -0.001† | -0.001* | 0.002* | 9.03E-04 |
| | (0.0006) | (6.56E-04) | (0.001) | (7.23E-04) |
| Firm age | -0.013† | -0.006 | 0.054*** | 0.018** |
| | (0.007) | (0.008) | (0.013) | (0.007) |
| Managerial ownership | -0.007 | -0.005 | -0.045† | -0.018† |
| | (0.014) | (0.015) | (0.024) | (0.011) |
| (Managerial ownership)$^2$ | 1.86E-06 | 1.39E-05 | 8.32E-04 | 2.81E-04 |
| | (0.0003) | (3.19E-04) | (5.17E-04) | (2.29E-04) |
| Absorbed slack | | | | 2.20E-04 |
| | | | | (1.48E-04) |
| Potential slack | | | | 3.78E-04*** |
| | | | | (7.85E-05) |
| Unabsorbed slack | | | | -0.059*** |
| | | | | (0.007) |
| Sales growth | | | | 8.49E-05 |
| | | | | (1.02E-04) |
| Board independence | 0.002 | -7.16E-04 | -0.003 | |
| | (0.002) | (1.83E-03) | (0.003) | |
| CEO educational background | 0.028 | -0.025 | -0.155* | |
| | (0.042) | (0.044) | (0.074) | |
| CEO Firm tenure | -0.004 | 5.73E-04 | -0.005 | |
| | (0.004) | (0.005) | (0.008) | |
| CEO duality | -0.043 | -0.078† | 0.043 | |
| | (0.040) | (0.042) | (0.074) | |
| CEO intrafirm career variety | | | 0.010 | |
| | | | (0.033) | |
| Number of observations | 455 | 461 | 527 | 811 |
| Within $R^2$ | 0.060 | 0.043 | 0.107 | 0.311 |
| F-statistics | 1.91* | 1.34 | 3.83*** | 18.18*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

This research hypothesizes that family involvement in TMT moderates the relationship between family CEO and TMT managerial resources (Hypothesis 5 and Hypothesis 6). Models 12 and Model 13 in Table 4.8 were used to test the moderating effect of family involvement in TMT on the relationship between family CEO and externally-linked TMT resources (Hypothesis 5). In Model 12, TMT external connections were regressed on family CEO, family involvement in TMT, and the two-way interaction of family CEO and family involvement in TMT, as well as control variables. CEO duality consistently remained a positive association with TMT external connections, while CEO firm tenure and CEO external connections, as control variables, had a negative effect on TMT external connections. However, the two-way interaction effect was not significant in Model 12. In Model 13, when TMT prior organizational experiences was used as a proxy of externally-linked TMT resources, firm size and managerial ownership were positively related to TMT prior organizational experiences. However, the two-way interaction effect of family CEO and family involvement in TMT remained non-significant in Model 13. Hypothesis 5 is not supported.

Model 14 through Model 16 were used to test the moderation effect of family involvement in TMT on the relationship between family CEO and internally-linked TMT resources (Hypothesis 6). In Model 14, when TMT firm tenure was used as a proxy of internally-linked TMT resources, family ownership was negatively related to TMT firm tenure, while the two-way interaction of family CEO and family involvement in TMT did not have a significant effect. In Model 15, family performance had a negative effect on TMT team tenure; however, the effect of the two-way interaction of family CEO and family involvement in TMT remained non-significant. In Model 16, family ownership,

firm performance and firm age were positively associated with TMT intrafirm career variety, while CEO educational background had a negative effect on TMT intrafirm career variety. The two-way interaction of family CEO and family involvement in TMT did not have a significant effect on TMT intrafirm career variety. In sum, Hypothesis 6 is not supported.

Table 4.8 Family CEO and TMT External Resources: Family members in TMT as Moderator

| | TMT External Connections | TMT Prior Org Experiences | TMT Firm Tenure | TMT Team Tenure | TMT Intrafirm Career Variety |
|---|---|---|---|---|---|
| | Model 12 | Model 13 | Model 14 | Model 15 | Model 16 |
| Intercept | -0.307 | -4.270 | 0.975*** | 1.003*** | 1.468** |
| | (0.933) | (4.572) | (0.277) | (0.292) | (0.495) |
| Family CEO | -0.340 | -3.178 | 0.122 | -0.153 | -0.010 |
| | (0.402) | (1.962) | (0.130) | (0.130) | (0.208) |
| Family involvement in TMT | 0.562 | -2.042 | -0.058 | -0.144 | 0.251 |
| | (0.574) | (2.771) | (0.158) | (0.165) | (0.296) |
| Family CEO*Family involvement in TMT | -0.492 | -1.238 | -0.123 | 0.139 | -0.095 |
| | (0.727) | (3.624) | (0.219) | (0.225) | (0.372) |
| *Control variables:* | | | | | |
| Family ownership | 0.020 | -0.043 | -0.017** | -0.009 | 0.032** |
| | (0.021) | (0.103) | (0.006) | (0.006) | (0.011) |
| Firm size | -0.064 | 0.992* | -4.46-04 | 0.007 | 0.005 |
| | (0.084) | (0.416) | (0.027) | (0.028) | (0.043) |
| Performance | 8.88E-04 | -0.008 | -0.001† | -0.001* | 0.002* |
| | (0.002) | (0.010) | (0.0006) | (0.0007) | (0.001) |
| Firm age | 0.041† | 0.281* | -0.013† | -0.008 | 0.055*** |
| | (0.025) | (0.124) | (0.007) | (0.008) | (0.013) |
| Managerial ownership | 0.069 | 0.617* | -0.005 | -0.007 | -0.048† |
| | (0.048) | (0.239) | (0.015) | (0.016) | (0.025) |
| (Managerial ownership)$^2$ | -9.90E-04 | -0.007 | -4.19E-05 | 1.86E-05 | 8.81E-04† |
| | (0.001) | (0.005) | (3.08E-04) | (3.28E-04) | (5.27E-04) |
| Board independence | 0.004 | 0.015 | 0.002 | -5.89E-04 | -0.003 |
| | (0.005) | (0.025) | (0.002) | (0.002) | (0.003) |
| CEO educational background | -0.296† | 0.241 | 0.019 | 0.004 | -0.193* |
| | (0.176) | (0.848) | (0.050) | (0.052) | (0.092) |
| CEO Firm tenure | -0.040** | -0.080 | -0.004 | 0.002 | -0.006 |
| | (0.013) | (0.066) | (0.004) | (0.005) | (0.008) |
| CEO duality | 0.667*** | 0.693 | -0.039 | -0.071† | 0.030 |
| | (0.157) | (0.715) | (0.041) | (0.043) | (0.076) |
| CEO external connections | -0.201** | | | | |
| | (0.066) | | | | |
| CEO prior org experiences | | 0.297 | | | |
| | | (0.234) | | | |
| CEO intrafirm career variety | | | | | 0.018 |
| | | | | | (0.034) |
| Number of observations | 517 | 503 | 455 | 461 | 527 |
| Within $R^2$ | 0.093 | 0.061 | 0.061 | 0.047 | 0.109 |
| F-statistics | 2.74*** | 1.68† | 1.64† | 1.24 | 3.34*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

### 4.3.3 Orchestration Effect – Family CEO as Moderator

This research hypothesizes that family CEO has a positive moderating effect on the relationship between externally-linked TMT resources and innovation input (Hypothesis 7). According to the research model shown in Figure 3.1, family CEO is the independent variable (Hypothesis 1) and TMT externally-linked resources mediate the relationship between CEO type and firm innovation (Hypothesis 3). In Hypothesis 7, this study suggests that the independent variable (i.e., family CEO) moderates the relationship between the mediator (i.e., externally-linked TMT resources) and the dependent variable (i.e., innovation input), which is a specific case of moderated mediation effect. This specific type of model has been described (e.g., James & Brett, 1984; Preacher, Rucker, & Hayes, 2007) and used in prior studies (e.g., Judd, Kenny, & McClelland, 2001)[1]. Employing the regression model described in these prior studies, Models 17 and Model 18 in Table 4.9 test the moderating effect of family CEO. In Model 17, family CEO had a negative effect (β=-0.277, *p*-value=0.013) on firm innovation input, while the association between TMT external connections and innovation input was not significant. The interaction of family CEO and TMT external connections did have a positive but not significant effect on firm innovation input. In Model 18, the effect of family CEO on innovation input was negative (β=-0.529, *p*-value<0.001), while TMT prior

[1] While the regression model of this specific type of moderated mediation effect has been described and theoretically justified in prior studies (e.g., James & Brett, 1984; Preacher et al., 2007), critics still exist partly due to the raised ambiguity for explaining the interaction effect of the independent variable and the mediator (Jacoby & Sassenberg, 2011). For instance, Jacoby and Sassenberg (2011) admit that the interaction effect of the independent variable and the mediator is relevant for explaining the variance of dependent variable. Whereas, they point out the explanation of the variance should be careful: a significant interaction effect of the independent variable and the mediator may indicate the impact of a variable unexamined in the model or a non-linear impact of the mediator on the dependent variable. A solid theoretical justification should be built to articular the main effect of the independent variable and the moderating effect on the mediator-dependent variable relationship.

organizational experiences did not have a significant effect on innovation input. In support of Hypothesis 7, the effect of the two-way interaction of family CEO and TMT prior organizational experiences on firm innovation input was positive and significant (β=0.026, *p*-value=0.009). This suggests that top managers' prior organizational experiences, as one type of a firm's externally-linked TMT resources, contribute to innovation input in family-CEO-managed firms, while this effect could not be found in professional-CEO-managed firms. Hypothesis 7 is supported by using TMT prior organizational experiences as a proxy of externally-linked TMT resources. This moderating effect is plotted in Figure 4.1.

Table 4.9 Externally-Linked TMT Resources and Innovation Input: Family CEO as Moderator

| | Innovation Input | |
|---|---|---|
| | Model 17 | Model 18 |
| Intercept | -0.389 | -0.251 |
| | (0.269) | (0.268) |
| Family CEO | -0.277* | -0.529*** |
| | (0.111) | (0.140) |
| TMT external connections | 0.025 | |
| | (0.019) | |
| TMT prior org experiences | | -0.003 |
| | | (0.003) |
| Family CEO*TMT external connections | 0.065 | |
| | (0.059) | |
| Family CEO*TMT prior org experiences | | 0.026** |
| | | (0.010) |
| *Control variables:* | | |
| Family ownership | -0.003 | -0.001 |
| | (0.006) | (0.006) |
| Firm size | 0.498*** | 0.501*** |
| | (0.039) | (0.039) |
| Performance | -2.40E-04 | -1.72E-04 |
| | (7.50E-04) | (7.43E-04) |
| Firm age | 0.029*** | 0.026** |
| | (0.007) | (0.007) |
| Managerial ownership | 0.049*** | 0.054*** |
| | (0.012) | (0.012) |
| (Managerial ownership)$^2$ | -0.001*** | -0.001*** |
| | (2.49E-04) | (2.48E-04) |
| Absorbed slack | 7.33E-05* | 8.79E-05* |
| | (3.69E-05) | (3.66E-05) |
| Potential slack | 6.04E-04*** | 6.13E-04*** |
| | (8.00E-05) | (7.92E-05) |
| Unabsorbed slack | -0.015** | -0.020** |
| | (6.08E-03) | (0.006) |
| Sales growth | -2.19E-04 | -2.01E-04† |
| | (1.22E-04) | (1.21E-04) |
| Number of observations | 923 | 907 |
| Within $R^2$ | 0.296 | 0.301 |
| F-statistics | 22.52*** | 22.72*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

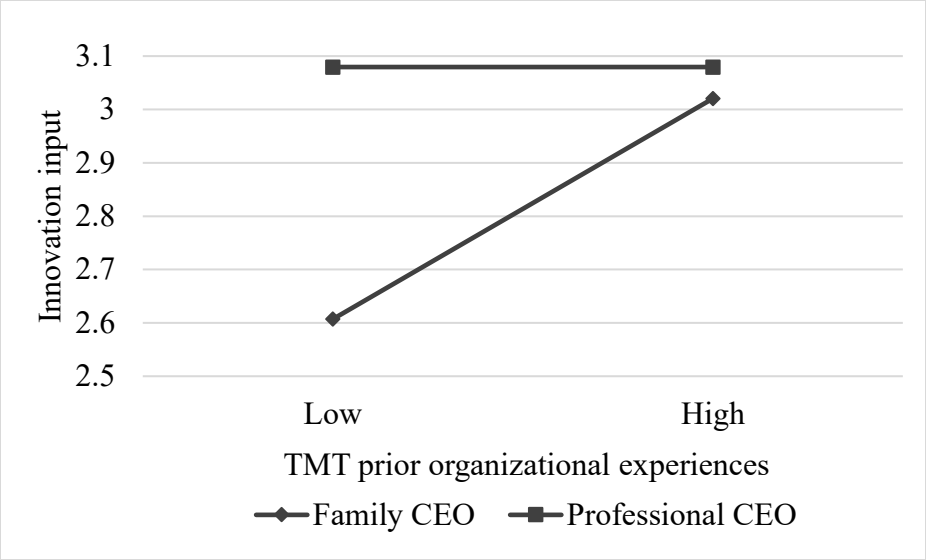


Figure 4.1 CEO Type, TMT Prior Organizational Experiences and Innovation Input

This research hypothesizes that family CEO has a positive moderating effect on the relationship between internally-linked TMT resources and firm innovation output (Hypothesis 8). Models 19 through Model 21 in Table 4.10 were used to test the moderating effect of family CEO. Firm size, firm age and potential slack remained a positive effect on firm innovation output in Model 19 through Model 21, while the association between unabsorbed slack and innovation output was negative. In Model 19, the effect of two-way interaction of family CEO and TMT firm tenure on innovation output was significantly positive (β=0.275, *p*-value=0.048). In Model 20, the interaction of family CEO and TMT team tenure had a marginal positive effect on innovation output (β=0.241, *p*-value=0.076). In Model 21, the interaction of family CEO and TMT intrafirm career variety had a significant positive effect on firm innovation output (β=0.162, *p*-value=0.014). The results suggest that TMT firm tenure, team tenure, and intra-firm career variety, as three proxies of internally-linked TMT resources, contributed

to innovation output in family-CEO-managed firms, while such effect was not observed in professional-CEO-managed firms. Hypothesis 8 is supported. The moderating effects of family CEO on the relationship between internally-linked TMT resources and innovation output are plotted in Figure 4.2, Figure 4.3 and Figure 4.4.

Table 4.10 Internally-Linked TMT Resources and Innovation Output: Family CEO as Moderator

| | Innovation Output | | |
|---|---|---|---|
| | Model 19 | Model 20 | Model 21 |
| Intercept | 3.273*** | 3.455*** | 3.770*** |
| | (0.245) | (0.249) | (0.232) |
| Family CEO | 0.016 | 0.043 | -0.054 |
| | (0.140) | (0.141) | (0.171) |
| TMT firm tenure | -0.028 | | |
| | (0.054) | | |
| TMT team tenure | | -0.026 | |
| | | (0.051) | |
| TMT intrafirm career variety | | | -0.028 |
| | | | (0.026) |
| Family CEO*TMT firm tenure | 0.275* | | |
| | (0.139) | | |
| Family CEO*TMT team tenure | | 0.241† | |
| | | (0.136) | |
| Family CEO*TMT intrafirm career variety | | | 0.162* |
| | | | (0.066) |
| *Control variables:* | | | |
| Log(R&D) | 0.048 | 0.065† | 0.036 |
| | (0.038) | (0.038) | (0.028) |
| Family ownership | 0.002 | -0.005 | -0.007 |
| | (0.005) | (0.005) | (0.005) |
| Firm size | 0.354*** | 0.348*** | 0.295*** |
| | (0.040) | (0.041) | (0.036) |
| Performance | 8.43E-04 | 8.83E-04 | 0.001* |
| | (7.20E-04) | (7.33E-04) | (6.79E-04) |
| Firm age | 0.019** | 0.014* | 0.011† |
| | (0.007) | (0.007) | (0.006) |
| Managerial ownership | -0.017 | -0.004 | -0.015 |
| | (0.011) | (0.010) | (0.010) |
| (Managerial ownership)$^2$ | 2.75E-04 | -1.58E-04 | -1.78E-05 |
| | (2.27E-04) | (2.14E-04) | (2.02E-05) |
| Absorbed slack | 2.45E-04† | 1.65E-04 | 1.26E-04 |
| | (1.48E-04) | (1.53E-04) | (8.07E-05) |
| Potential slack | 3.79E-04*** | 3.37E-04*** | 2.59E-04*** |
| | (7.79E-05) | (7.94E-05) | (6.88E-05) |
| Unabsorbed slack | -0.060*** | -0.059*** | -0.046*** |
| | (0.006) | (0.006) | (0.005) |
| Sales growth | 7.62E-05 | 7.63E-05 | 3.69E-05 |
| | (1.02E-04) | (1.04E-04) | (1.02E-04) |
| Number of observations | 811 | 833 | 938 |
| Within $R^2$ | 0.315 | 0.309 | 0.273 |
| F-statistics | 19.91*** | 19.94*** | 18.99*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

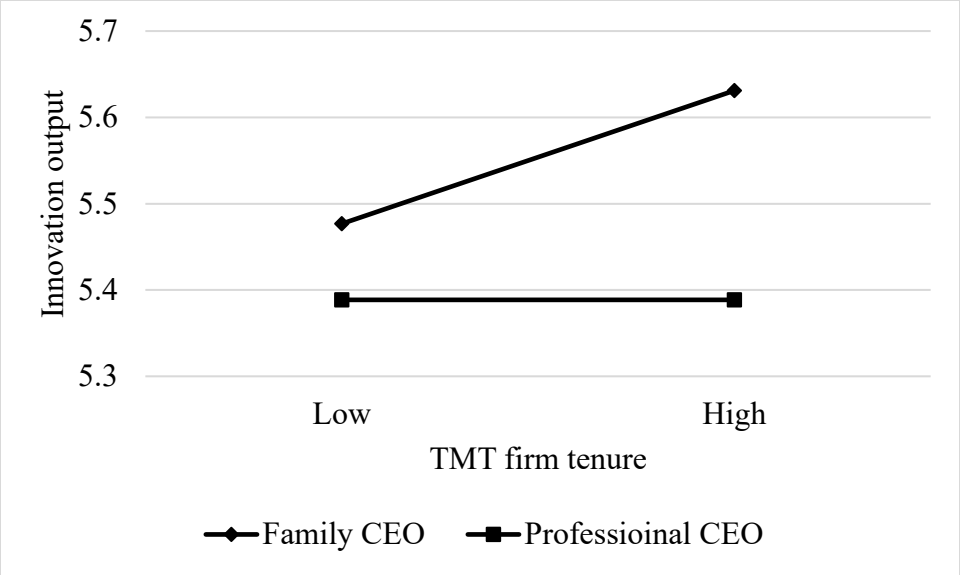


Figure 4.2 CEO Type, TMT Firm Tenure and Innovation Output

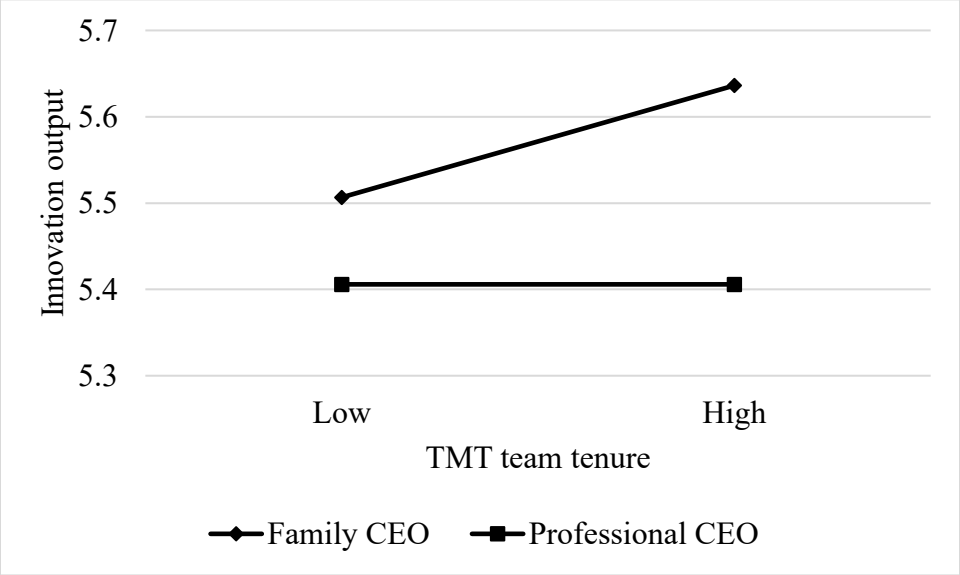


Figure 4.3 CEO Type, TMT Team Tenure and Innovation Output

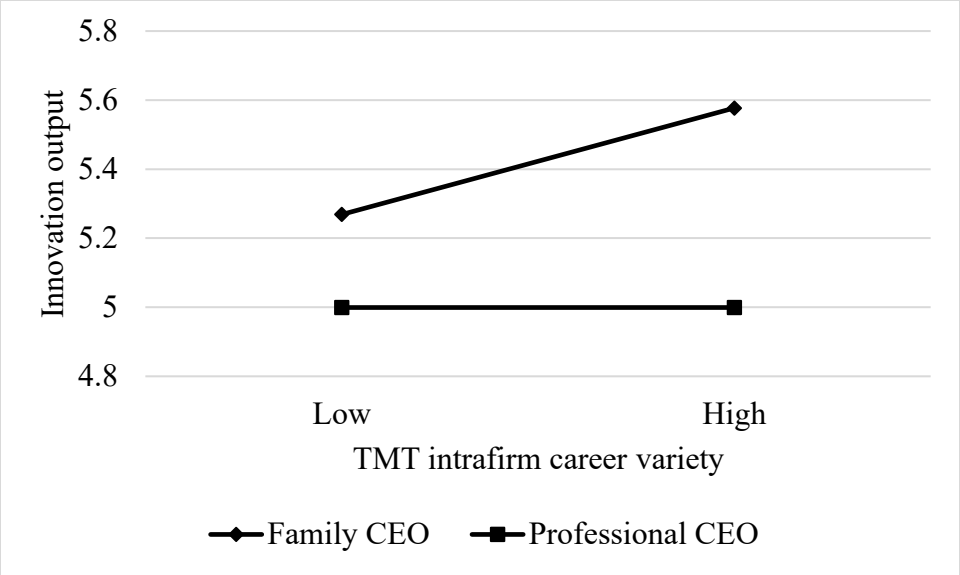


Figure 4.4 CEO Type, TMT Intrafirm Career Variety and Innovation Output

A summary of the hypothesized relationships and empirical results are presented in Table 4.11. Of the eight hypotheses in this research, four were fully supported, one was marginally supported, and three were not supported. A deeper investigation into the relationships was conducted in the following section using *post hoc* analysis.

Table 4.11 Hypothesized Relationships and Results

| Main effect: CEO type and firm innovation | | Result |
|---|---|---|
| H1 | A family CEO-managed firm has less innovation input than a professional CEO-managed firm. | Supported |
| H2 | A family CEO-managed firm has greater innovation output than a professional CEO-managed firm. | Supported |
| Mediation effect: TMT managerial resources as mediators (configuration role of family CEO) | | |
| H3 | Externally-linked TMT resources (i.e., prior organizational experiences and external connections) partially mediate the relationship between the presence of a family CEO and firm innovation input, such that a family CEO-managed firm has lower levels of such resources than one that is professionally managed, with these TMT resources being positively related to innovation input. | Supported (TMT external connections, marginal) |
| H4 | Internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety) partially mediate the relationship between the presence of a family CEO and firm innovation output, such that a family CEO-managed firm has higher levels of such resources than one that is professionally managed, with these TMT resources being positively related to innovation output. | Not supported |
| H5 | Family involvement in the TMT strengthens the relationship between the presence of a family CEO and externally-linked TMT resources (i.e., prior organizational experiences and external connections), such that the relationship is more negative when family members are involved in the TMT. | Not supported |
| H6 | Family involvement in the TMT strengthens the relationship between the presence of a family CEO and internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety), such that the relationship is more positive when family members are involved in the TMT. | Not supported |
| Moderating effect: Family CEO as moderator (orchestration role of family CEO) | | |
| H7 | A family CEO positively moderates the relationship between externally-linked TMT resources (i.e., prior organizational experiences and external connections) and innovation input. | Supported (TMT prior org experiences) |
| H8 | A family CEO positively moderates the relationship between internally-linked TMT resources (i.e., firm tenure, team tenure, and intrafirm career variety) and innovation output. | Supported (firm tenure, intrafirm career variety; team tenure, marginally) |

## 4.4 *Post Hoc* Tests

This research conducted *post hoc* tests for two reasons. First, empirical results did not support relationships hypothesized in Hypotheses 4, 5, and 6. *Post hoc* tests were conducted in this section to explore potential moderating effects that may influence these unsupported hypothesized relationships between family CEO and TMT resources. The results of these potential moderator tests are presented in Section 4.4.1 *Post Hoc* Tests — Potential Moderator. Second, this research distinguished family firms from nonfamily firms and duplicated the empirical tests conducted in the previous section by using the family firm subsample. The goal of the duplicated tests is to examine family firm heterogeneity – whether the distinctive effects associated with family CEO still exist by comparing family-CEO-managed firms with professional-CEO-managed family firms. The results of these empirical tests are presented in Section 4.4.2 *Post Hoc* Tests — Family Firm Heterogeneity.

### 4.4.1 *Post Hoc* Tests – Potential Moderator

In the previous section, the empirical tests report that family CEO had a negative direct effect on firm innovation input (Hypothesis 1) and a positive direct effect on innovation output (Hypothesis 2). Findings support that TMT externally-linked resources partially mediated the relationship between family CEO and innovation input (Hypothesis 3). In addition, findings also suggest that family CEO positively moderates the relationship between externally-linked TMT resources and firm innovation input (Hypothesis 7) and the relationship between internally-linked TMT resources and innovation output (Hypothesis 8). However, the empirical examination did not support that internally-linked TMT resources mediate the relationship between family CEO and

innovation output (Hypothesis 4). The hypothesized moderating effect of family involvement in TMT on the relationship between family CEO and TMT resources was not supported either (Hypothesis 5 and Hypothesis 6). In this section, a number of tests were conducted to examine potential moderating effects that may influence the hypothesized relationships between family CEO and TMT resources.

Prior studies suggest that CEO duality is a salient predictor for CEO power (e.g., Daily & Johnson, 1997; Pathan, 2009), which may influence TMT resource configuration. The empirical analysis in the previous section controlled the effects of CEO duality on TMT resource configuration. However, *post hoc* tests conducted in this section examined the moderating effect of CEO duality on the relationship between family CEO and TMT resources. Results are presented in Table 4.12.

CEO duality was disaggregated into CEO duality as Chairman. In Model 1 and Model 2 (Table 4.12), externally-linked TMT resources were regressed by CEO duality (Chairman) and the interaction of family CEO and CEO duality (Chairman), as well as all the variables used in previous analysis (i.e., Model 5 and Model 6 in Table 4.6). Compared to empirical results shown in Model 5 (Table 4.6), which reported a negative association between family CEO and TMT external connections ($\beta$=-0.594, *p*-value=0.081), the association between family CEO and TMT external connections in Model 1 (Table 4.12) became positive and non-significant and the interaction effect of family CEO and CEO duality (Chairman) became negative ($\beta$=-1.780, *p*-value<0.001). The results indicate that CEO duality (Chairman) moderates the relationship between family CEO and TMT external connections in such a way that TMT external connections are significantly lower only in firms managed by a family CEO who also takes the

Chairman position. The interaction effect was plotted in Figure 4.5. However, such moderating effect was not found for TMT prior organizational experiences.

Model 3 through Model 5 in Table 4.12 regressed internally-linked TMT resources by CEO duality (Chairman) and the interaction of family CEO and CEO duality (Chairman), as well as all the variables used in previous analysis (i.e., Model 8 through Model 10 in Table 4.7). The interaction of family CEO and CEO duality (Chairman) had a positive effect on TMT firm tenure (β=0.315, *p*-value=0.035) and TMT team tenure (β=0.411, *p*-value=0.007). The results indicate that CEO duality (Chairman) positively moderates the relationship between family CEO and TMT firm/team tenure. Specifically speaking, concerning TMT firm tenure, TMTs are more diverse in firms where family CEOs take the Chairman position. Concerning TMT team tenure, TMTs have the greatest diversity in firms where the family CEO takes the Chairman position and have the least diversity in firms where the family CEO does not have the dual role, while firms managed by a professional CEO are in the middle. The interaction effects of family CEO and CEO duality (Chairman) on TMT firm/team tenure were plotted in Figure 4.6 and Figure 4.7. When using TMT intrafirm career variety as a proxy of internally-linked TMT resources, CEO duality (Chairman) had a positive effect (β=0.315, *p*-value=0.002) and the interaction of family CEO and CEO duality (Chairman) had a negative effect (β=-0.458, *p*-value=0.049) on TMT intrafirm career variety. The interaction effects of family CEO and CEO duality (Chairman) on TMT intrafirm career variety were plotted in Figure 4.8.

Table 4.12 *Post Hoc* Test – Two-Way Interaction of CEO Duality (Chairman) and Family CEO

| | TMT External Connections | TMT Prior Org Experiences | TMT Firm Tenure | TMT Team Tenure | TMT Intrafirm Career Variety |
|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| Intercept | 0.213 | -3.481 | 0.915*** | 0.887** | 1.506*** |
| | (0.921) | (4.449) | (0.269) | (0.283) | (0.470) |
| Family CEO | 0.560 | -1.734 | -0.033 | -0.256* | 0.077 |
| | (0.406) | (1.975) | (0.114) | (0.119) | (0.202) |
| CEO duality | 0.259 | 0.999 | 0.003 | -0.075 | 0.315** |
| (Chairman) | (0.212) | (0.967) | (0.056) | (0.058) | (0.099) |
| Family CEO*CEO | -1.780*** | -2.552 | 0.315* | 0.411** | -0.458* |
| duality (Chairman) | (0.466) | (2.253) | (0.149) | (0.151) | (0.231) |
| *Control variables* | | | | | |
| Family ownership | 0.007 | -0.051 | -0.015* | -0.008 | 0.031** |
| | (0.021) | (0.103) | (0.006) | (0.006) | (0.011) |
| Firm size | -0.084 | 0.981* | -0.005 | 5.12E-04 | 0.010 |
| | (0.084) | (0.415) | (0.027) | (0.028) | (0.043) |
| Performance | 8.54E-04 | -0.008 | -0.001† | -0.001* | 0.002* |
| | (0.002) | (0.010) | (0.0006) | (6.53E-04) | (0.001) |
| Firm age | 0.041 | 0.285* | -0.013† | -0.004 | 0.054*** |
| | (0.025) | (0.123) | (0.007) | (0.008) | (0.012) |
| Managerial | 0.046 | 0.522* | -0.005 | 0.003 | -0.058* |
| ownership | (0.048) | (0.235) | (0.014) | (0.016) | (0.024) |
| (Managerial | -8.65E-04 | -0.006 | -1.81E-05 | -1.37E-04 | 0.001* |
| ownership)$^2$ | (0.001) | (0.005) | (2.99E-04) | (3.21E-04) | (0.0005) |
| Board independence | 0.002 | 0.014 | 0.002 | -5.69E-04 | -0.002 |
| | (0.005) | (0.025) | (0.002) | (0.002) | (0.003) |
| CEO educational | 0.148 | 0.371 | -0.010 | -0.053 | -0.183* |
| background | (0.157) | (0.755) | (0.044) | (0.046) | (0.079) |
| CEO Firm tenure | -0.043** | -0.086 | -0.004 | -4.63E-04 | -0.009 |
| | (0.013) | (0.067) | (0.004) | (0.005) | (0.008) |
| CEO external | -0.058 | | | | |
| connections | (0.066) | | | | |
| CEO prior org | | 0.255 | | | |
| experiences | | (0.230) | | | |
| CEO intrafirm career | | | | | 0.010 |
| variety | | | | | (0.032) |
| Number of | 517 | 503 | 455 | 461 | 527 |
| observations | | | | | |
| Within $R^2$ | 0.076 | 0.062 | 0.072 | 0.054 | 0.131 |
| F-statistics | 2.38** | 1.85* | 2.12* | 1.57† | 4.42*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

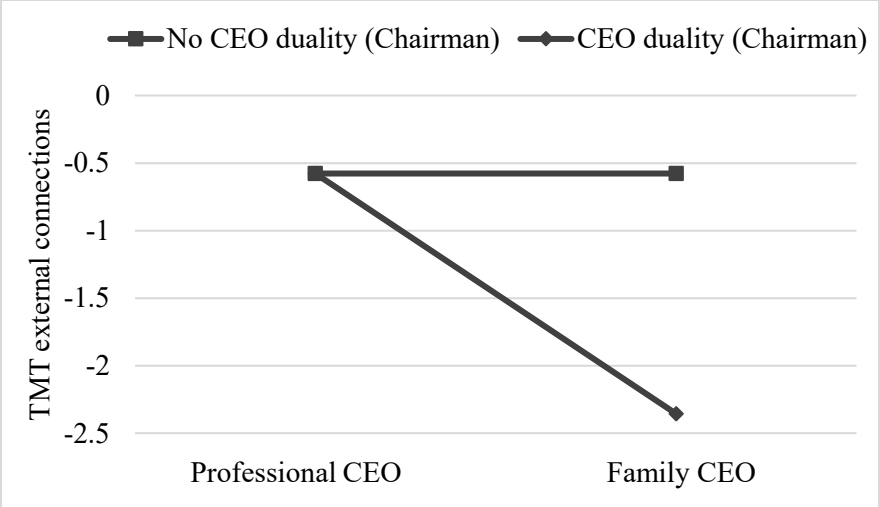


Figure 4.5 CEO Duality (Chairman), CEO Type and TMT External Connections

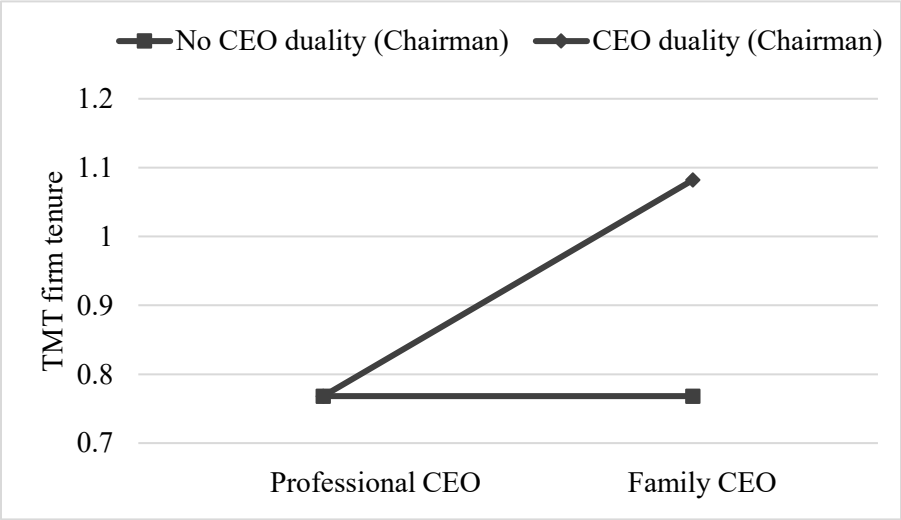


Figure 4.6 CEO Duality (Chairman), CEO Type and TMT Firm Tenure

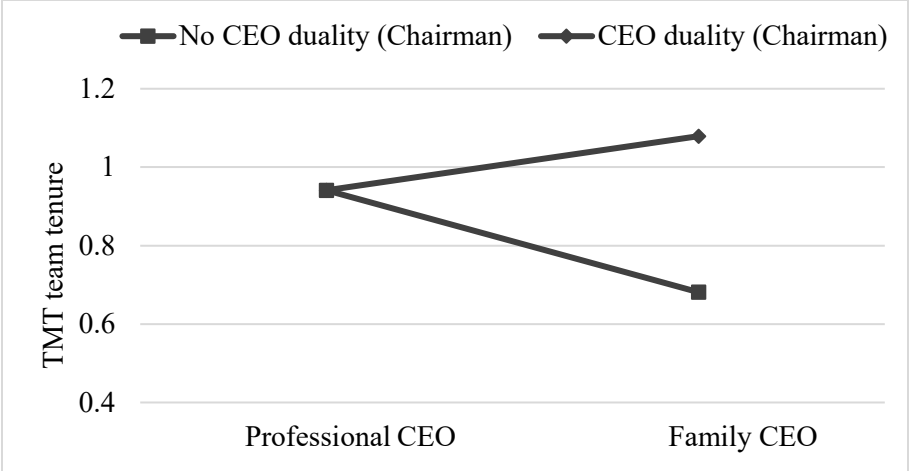


Figure 4.7 CEO Duality (Chairman), CEO Type and TMT Team Tenure


Figure 4.8 CEO Duality (Chairman), CEO Type and TMT Intrafirm Career Variety

### 4.4.2 *Post Hoc* Tests – Family Firm Heterogeneity

The empirical analysis in Section 4.3 examined the differences between family-CEO-managed firms and professional-CEO-managed firms with regard to TMT

resources and firm innovation. Nevertheless, the differences found in the previous section may be attributed to the distinctiveness caused by family ownership. In this section, this research separates family firms from nonfamily firms, first, and conducts the same empirical analysis by using the family firm subsample. The findings of the duplication tests provide convincing evidence for the results reported in Section 4.3 on the one hand, and facilitated examinations of family firm heterogeneity on the other hand.

*Post hoc* tests using a family firm subsample further support Hypothesis 1 and Hypothesis 2. The empirical results are provided in Table 4.13. In Model 1, innovation input was regressed by all the control variables. In Model 2, family CEO was negatively associated with innovation input (β=-0.458, *p*-value=0.006), suggesting that family firms managed by a family CEO had less innovation input than family firms managed by a professional CEO. Specifically, the empirical results indicate that family firms managed by a family CEO invested 37% less than family firms managed by a professional CEO ($e^{-0.458}$-1).

In Model 3, innovation output was regressed by all the control variables. In Model 4, family CEO was positively associated with innovation output (β=-0.243, *p*-value=0.033), suggesting that, given innovation input, family firms managed by a family CEO had more innovation output than family firms managed by a professional CEO. Specifically, the empirical results indicate that, given innovation input, family firms managed by a family CEO had 28% greater innovation output than family firms managed by a professional CEO ($e^{0.243}$-1).

Table 4.13 *Post Hoc* Test: Family Firm Heterogeneity (H1 and H2)

| | Innovation Input | | Innovation Output | |
|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 |
| Intercept | -0.623 | -0.561 | 3.689*** | 3.686*** |
| | (0.615) | (0.608) | (0.437) | (0.434) |
| Family CEO | | -0.458** | | 0.243* |
| | | (0.166) | | (0.114) |
| *Control variables* | | | | |
| Log(R&D) | | | 0.016 | 0.022 |
| | | | (0.038) | (0.038) |
| Family ownership | 0.002 | -7.68E-04 | -0.008 | -0.007 |
| | (0.008) | (7.98E-03) | (0.006) | (0.006) |
| Firm size | 0.540*** | 0.558*** | 0.276*** | 0.263*** |
| | (0.075) | (0.074) | (0.056) | (0.056) |
| Performance | -0.001 | -0.001 | 0.003** | 0.003** |
| | (0.002) | (0.001) | (0.001) | (0.001) |
| Firm age | 0.005 | 0.004 | -0.010 | -0.010 |
| | (0.016) | (0.015) | (0.011) | (0.011) |
| CEO Shares | 0.032* | 0.068*** | 0.021† | 0.002 |
| | (0.016) | (0.020) | (0.011) | (0.014) |
| CEO Shares* CEO Shares | -8.36E-04* | -0.001*** | -6.44E-04* | -3.56E-04 |
| | (3.59E-04) | (0.0004) | (2.49E-04) | (2.82E-04) |
| Absorbed slack | 5.29E-04† | 5.56E-04† | 6.72E-04*** | 6.57E-04** |
| | (2.90E-04) | (2.86E-04) | (2.01E-04) | (2.00E-04) |
| Potential slack | 9.59E-04*** | 9.43E-04*** | 9.53E-05 | 9.95E-05 |
| | (1.94E-04) | (1.91E-04) | (1.37E-04) | (1.36E-04) |
| Unabsorbed slack | -0.011 | -0.011 | -0.025*** | -0.026*** |
| | (0.009) | (0.009) | (0.007) | (0.007) |
| Sales growth | -2.25E-04 | -1.81E-04 | 1.40E-04 | 1.26E-04 |
| | (4.64E-04) | (4.59E-04) | (3.22E-04) | (3.20E-04) |
| Number of observations | 373 | 373 | 372 | 372 |
| Within $R^2$ | 0.229 | 0.250 | 0.276 | 0.289 |
| F-statistics | 8.03*** | 8.17*** | 9.34*** | 9.06*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

*Post hoc* tests using family firm subsample did not support Hypothesis 3 through Hypothesis 5. Model 5 through Model 7 in Table 4.14 duplicated the tests for Hypothesis 3 that are presented in Table 4.6. Model 8 through Model 11 in Table 4.15 duplicated the tests for Hypothesis 4 that are presented in Table 4.7. Model 12 through Model 16 in Table 4.16 duplicated the tests for Hypothesis 5 and Hypothesis 6 that are presented in

Table 4.8. However, using family firm subsample, findings marginally supported Hypothesis 6. In Table 4.16, the interaction of family CEO and family involvement in TMT was positively related to TMT team tenure (β=0.847, *p*-value=0.079). Results indicate that, regarding TMT team tenure, TMTs have more diverse tenure in family firms managed by family CEOs and when other family members are involved in the TMT than family firms managed by professional CEOs or having no other family involvement in TMT. The interaction effect was plotted in Figure 4.9.

Table 4.14 *Post Hoc* Test: Family Firm Heterogeneity (H3)

| | TMT External Connections | TMT Prior Org Experiences | Innovation Input |
|---|---|---|---|
| | Model 5 | Model 6 | Model 7 |
| Intercept | 1.234 | 3.031 | -0.005 |
| | (1.072) | (8.367) | (0.625) |
| Family CEO | -0.064 | -1.524 | -0.474** |
| | (0.259) | (2.042) | (0.165) |
| TMT external connections | | | -0.010 |
| | | | (0.064) |
| TMT prior org experiences | | | 0.002 |
| | | | (0.009) |
| *Control variables:* | | | |
| Family ownership | 0.011 | -0.107 | -0.008 |
| | (0.014) | (0.106) | (0.008) |
| Firm size | 0.012 | 0.334 | 0.573*** |
| | (0.082) | (0.658) | (0.077) |
| Performance | 0.001 | 0.012 | -9.18E-04 |
| | (0.002) | (0.017) | (0.001) |
| Firm age | -0.024 | 0.323 | -0.010 |
| | (0.028) | (0.231) | (0.016) |
| Managerial ownership | 0.079* | 0.539† | 0.082*** |
| | (0.037) | (0.290) | (0.022) |
| (Managerial ownership)$^2$ | -0.001† | -0.007 | -0.002*** |
| | (7.53E-04) | (0.006) | (4.23E-04) |
| Absorbed slack | | | 6.01E-04* |
| | | | (2.94E-04) |
| Potential slack | | | 9.22E-04*** |
| | | | (1.90E-04) |
| Unabsorbed slack | | | -0.023* |
| | | | (0.011) |
| Sales growth | | | -2.50E-04 |
| | | | (4.49E-04) |
| Board independence | -1.18E-04 | -0.006 | |
| | (0.004) | (0.033) | |
| CEO educational background | 0.091 | -1.106 | |
| | (0.147) | (1.088) | |
| CEO Firm tenure | -0.013 | -0.152 | |
| | (0.014) | (0.116) | |
| CEO duality | -0.555* | 0.087 | |
| | (0.224) | (1.716) | |
| CEO external connections | -0.028 | | |
| | (0.100) | | |
| CEO prior org experiences | | -0.590† | |
| | | (0.352) | |
| Number of observations | 208 | 204 | 354 |
| Within $R^2$ | 0.137 | 0.074 | 0.261 |
| F-statistics | 1.83* | 0.90 | 6.85*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

Table 4.15 *Post Hoc* Test: Family Firm Heterogeneity (H4)

| | TMT Firm Tenure | TMT Team Tenure | TMT Intrafirm Career Variety | Innovation Output |
|---|---|---|---|---|
| | Model 8 | Model 9 | Model 10 | Model 11 |
| Intercept | 0.598 | -0.797 | 2.120** | 2.371*** |
| | (0.587) | (0.668) | (0.839) | (0.592) |
| Family CEO | 0.045 | -0.182 | 0.080 | 0.150 |
| | (0.128) | (0.131) | (0.192) | (0.136) |
| TMT firm tenure diversity | | | | 0.284† |
| | | | | (0.160) |
| TMT team tenure diversity | | | | -0.151 |
| | | | | (0.145) |
| TMT intrafirm career variety | | | | 0.128 |
| | | | | (0.080) |
| *Control variables:* | | | | |
| Log (R&D) | | | | 0.037 |
| | | | | (0.062) |
| Family ownership | -0.014* | -0.004 | 0.024* | -0.001 |
| | (0.007) | (0.007) | (0.010) | (0.007) |
| Firm size | 0.036 | 0.133** | 0.051 | 0.485*** |
| | (0.046) | (0.047) | (0.059) | (0.082) |
| Performance | -3.80E-04 | -0.002† | 4.20E-04 | 0.002† |
| | (0.001) | (0.001) | (0.002) | (0.001) |
| Firm age | -3.52E-04 | 0.042† | 0.042* | -0.007 |
| | (0.017) | (0.022) | (0.021) | (0.015) |
| Managerial ownership | -0.012 | 0.003 | -0.045† | -0.012 |
| | (0.019) | (0.023) | (0.026) | (0.017) |
| (Managerial ownership)$^2$ | 1.66E-04 | -3.62E-06 | 7.49E-04 | 2.01E-04 |
| | (3.84E-04) | (4.52E-02) | (5.49E-04) | (3.55E-04) |
| Absorbed slack | | | | 6.02E-04** |
| | | | | (2.10E-04) |
| Potential slack | | | | 4.44E-04** |
| | | | | (1.58E-04) |
| Unabsorbed slack | | | | -0.055*** |
| | | | | (0.013) |
| Sales growth | | | | -6.74E-05 |
| | | | | (3.43E-04) |
| Board independence | -8.17E-04 | -0.003 | -0.003 | |
| | (0.003) | (0.003) | (0.003) | |
| CEO educational background | 0.017 | 0.033 | -0.056 | |
| | (0.074) | (0.097) | (0.104) | |
| CEO Firm tenure | -0.006 | -0.033† | -0.011 | |
| | (0.009) | (0.020) | (0.013) | |
| CEO duality | 0.197† | 0.227* | -0.408* | |
| | (0.112) | (0.110) | (0.163) | |
| CEO intrafirm career variety | | | -0.056 | |
| | | | (0.052) | |
| Number of observations | 162 | 162 | 213 | 269 |
| Within $R^2$ | 0.140 | 0.190 | 0.171 | 0.338 |
| F-statistics | 1.53 | 2.20* | 2.44** | 6.18*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

Table 4.16 *Post Hoc* Test: Family Firm Heterogeneity (H5 & H6)

| | TMT External Connections | TMT Prior Org Experiences | TMT Firm Tenure | TMT Team Tenure | TMT Intrafirm Career Variety |
|---|---|---|---|---|---|
| | Model 12 | Model 13 | Model 14 | Model 15 | Model 16 |
| Intercept | 1.523 | 5.374 | 0.447 | -1.253† | 2.345** |
| | (1.128) | (9.303) | (0.619) | (0.702) | (0.878) |
| Family CEO | -0.209 | -0.492 | -0.065 | -0.287 | 0.297 |
| | (0.318) | (2.597) | (0.178) | (0.182) | (0.235) |
| Family involvement in TMT | -1.678† | 3.085 | -0.443 | 0.189 | 1.173† |
| | (0.935) | (8.746) | (0.692) | (0.813) | (0.691) |
| Family CEO*Family involvement in TMT | -0.613 | -3.774 | 0.436 | 0.847† | -0.259 |
| | (0.657) | (6.459) | (0.475) | (0.477) | (0.465) |
| *Control variables:* | | | | | |
| Family ownership | 0.004 | -0.126 | -0.014† | 0.001 | 0.024* |
| | (0.014) | (0.113) | (0.007) | (0.007) | (0.011) |
| Firm size | 0.026 | 0.305 | 0.033 | 0.125** | 0.035 |
| | (0.082) | (0.680) | (0.047) | (0.046) | (0.060) |
| Performance | 6.82E-04 | 0.013 | -5.48E-04 | -0.002† | 6.11E-04 |
| | (0.002) | (0.017) | (0.001) | (0.001) | (0.002) |
| Firm age | -0.023 | 0.306 | -0.004 | 0.046† | 0.041† |
| | (0.028) | (0.247) | (0.018) | (0.025) | (0.021) |
| Managerial ownership | 0.129** | 0.545 | -0.016 | -0.031 | -0.066* |
| | (0.043) | (0.356) | (0.026) | (0.027) | (0.031) |
| (Managerial ownership)$^2$ | -0.002* | -0.007 | 2.26E-04 | 5.72E-04 | 0.001† |
| | (8.48E-04) | (0.007) | (4.93E-04) | (5.15E-04) | (6.21E-04) |
| Board independence | -8.69E-04 | -0.012 | -5.53E-04 | -4.67E-04 | -0.003 |
| | (0.004) | (0.035) | (0.003) | (0.003) | (0.003) |
| CEO educational background | 0.235 | -2.882 | 0.274 | 0.270 | -0.377 |
| | (0.322) | (2.523) | (0.296) | (0.284) | (0.233) |
| CEO Firm tenure | -0.019 | -0.147 | -0.002 | -0.035 | -0.008 |
| | (0.014) | (0.118) | (0.010) | (0.024) | (0.014) |
| CEO duality | -0.660** | 0.496 | 0.171 | 0.209† | -0.311† |
| | (0.236) | (1.827) | (0.117) | (0.118) | (0.173) |
| CEO external connections | 0.006 | | | | |
| | (0.101) | | | | |
| CEO prior org experiences | | -0.519 | | | |
| | | (0.517) | | | |
| CEO intrafirm career variety | | | | | -0.067 |
| | | | | | (0.052) |
| Number of observations | 208 | 204 | 162 | 162 | 213 |
| Within $R^2$ | 0.164 | 0.078 | 0.148 | 0.229 | 0.189 |
| F-statistics | 1.91* | 0.81 | 1.35 | 2.30* | 2.33** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

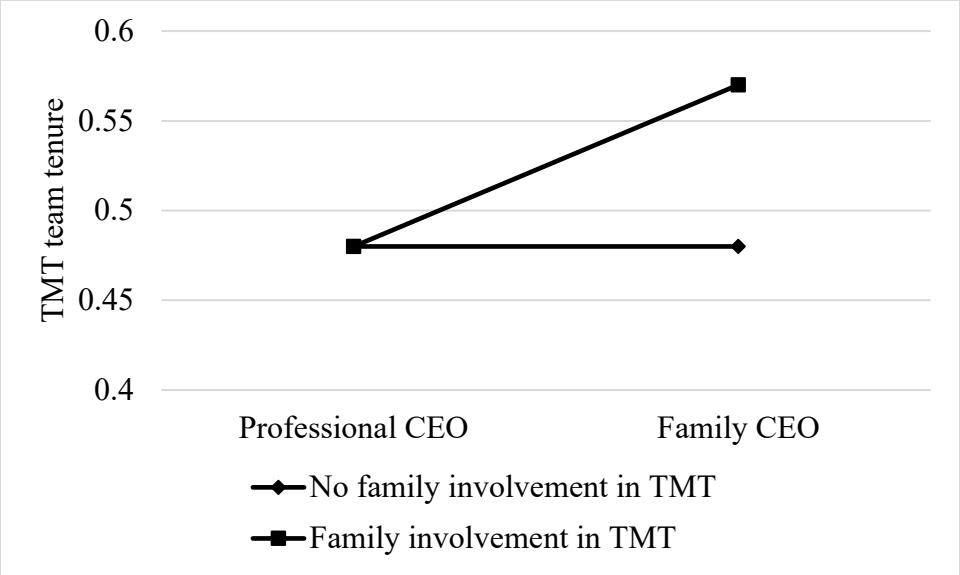


Figure 4.9 Family Firm Heterogeneity: Family Involvement in TMT as Moderator

Findings support Hypothesis 7 by using a family firm subsample. Results are provided in Table 4.17. In Model 17, family CEO was negatively associated with innovation input (β=-0.469, *p*-value=0.005); however, TMT external connections and the interaction of family CEO and TMT external connections did not have a significant effect on innovation input. In Model 18, family CEO was negatively associated with innovation input (β=-0.853, *p*-value<0.001), and the interaction of family CEO and TMT prior organizational experiences had a positive effect on firm innovation input (β=-0.042, *p*-value=0.008). The results in Model 18 suggest that, using a family firm subsample, family CEO still positively moderated the relationship between externally-linked TMT resources (using TMT prior organizational experiences as a proxy) and innovation input. The interaction effect was plotted in Figure 4.10.

Table 4.17 *Post Hoc* Test: Family Firm Heterogeneity (H7)

| | Innovation Input | |
|---|---|---|
| | Model 17 | Model 18 |
| Intercept | -0.236 | -0.024 |
| | (0.635) | (0.605) |
| Family CEO | -0.469** | -0.853*** |
| | (0.167) | (0.215) |
| TMT external connections | -0.055 | |
| | (0.103) | |
| TMT prior org experiences | | -0.015 |
| | | (0.011) |
| Family CEO*TMT external connections | 0.084 | |
| | (0.131) | |
| Family CEO*TMT prior org experiences | | 0.042** |
| | | (0.016) |
| *Control variables:* | | |
| Family ownership | -0.008 | -0.006 |
| | (0.008) | (0.008) |
| Firm size | 0.574*** | 0.588*** |
| | (0.078) | (0.076) |
| Performance | -0.001 | -0.001 |
| | (0.001) | (0.001) |
| Firm age | -0.003 | -0.007 |
| | (0.016) | (0.015) |
| Managerial ownership | 0.081*** | 0.084*** |
| | (0.022) | (0.021) |
| (Managerial ownership)$^2$ | -0.002*** | -0.002*** |
| | (0.0004) | (0.0004) |
| Absorbed slack | 5.39E-04† | 6.31E-04* |
| | (3.04E-04) | (2.77E-04) |
| Potential slack | 9.21E-04*** | 9.69E-04*** |
| | (1.93E-04) | (1.88E-04) |
| Unabsorbed slack | -0.019† | -0.025* |
| | (0.011) | (0.011) |
| Sales growth | -2.65E-04 | -2.73E-04 |
| | (4.57E-04) | (4.42E-04) |
| Number of observations | 359 | 354 |
| Within $R^2$ | 0.254 | 0.282 |
| F-statistics | 6.70*** | 7.60*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.


Figure 4.10 Family Firm Heterogeneity: Family CEO, TMT Prior Organizational Experiences and Innovation Input

*Post hoc* tests using a family firm subsample support Hypothesis 8. The empirical results are provided in Table 4.18. In Model 19 and Model 20, family CEO was not significantly associated with innovation output; neither was the interaction of family CEO and TMT firm/team tenure. In Model 21, the interaction of family CEO and TMT intrafirm variety had a positive effect on firm innovation output (β=0.188, *p*-value=0.022). The results confirm the findings presented in section 4.3 by using TMT intrafirm career variety as a proxy of internally-linked TMT resources — family CEO positively moderated the relationship between internally-linked TMT resources and innovation output. The interaction effect was plotted in Figure 4.11.

Table 4.18 *Post Hoc* Test: Family Firm Heterogeneity (H8)

| | Innovation Output | | |
|---|---|---|---|
| | Model 19 | Model 20 | Model 21 |
| Intercept | 2.689*** | 3.428*** | 4.013*** |
| | (0.578) | (0.571) | (0.452) |
| Family CEO | 0.071 | -0.069 | -0.184 |
| | (0.200) | (0.213) | (0.211) |
| TMT firm tenure | 0.034 | | |
| | (0.157) | | |
| TMT team tenure | | -0.178 | |
| | | (0.144) | |
| TMT intrafirm career variety | | | -0.073 |
| | | | (0.057) |
| Family CEO*TMT firm tenure | 0.168 | | |
| | (0.215) | | |
| Family CEO*TMT team tenure | | 0.275 | |
| | | (0.213) | |
| Family CEO*TMT intrafirm career variety | | | 0.188* |
| | | | (0.082) |
| *Control variables:* | | | |
| Log(R&D) | 0.021 | 0.043 | 0.020 |
| | (0.062) | (0.063) | (0.038) |
| Family ownership | 5.20E-04 | -0.009 | -0.011† |
| | (0.007) | (0.006) | (0.006) |
| Firm size | 0.480*** | 0.460*** | 0.308*** |
| | (0.082) | (0.084) | (0.059) |
| Performance | 0.002 | 0.002 | 0.003** |
| | (0.001) | (0.001) | (0.001) |
| Firm age | -0.003 | -0.015 | -0.015 |
| | (0.015) | (0.014) | (0.011) |
| Managerial ownership | -0.017 | 0.008 | -0.002 |
| | (0.017) | (0.017) | (0.014) |
| (Managerial ownership)$^2$ | 2.75E-04 | 3.88E-04 | -2.95E-04 |
| | (3.50E-04) | (3.30E-04) | (2.79E-04) |
| Absorbed slack | 6.08** | 5.74E-04** | 6.04E-04** |
| | (2.03E-04) | (2.16E-04) | (2.01E-04) |
| Potential slack | 4.67E-04** | 3.47E-04* | 1.15E-04 |
| | (1.59E-04) | (1.60E-04) | (1.37E-04) |
| Unabsorbed slack | -0.059*** | -0.056*** | -0.040*** |
| | (0.013) | (0.012) | (0.008) |
| Sales growth | -7.82E-05 | -5.86E-05 | 1.05E-04 |
| | (3.46E-04) | (3.60E-04) | (3.14E-04) |
| Number of observations | 269 | 284 | 365 |
| Within $R^2$ | 0.325 | 0.327 | 0.318 |
| F-statistics | 6.29*** | 6.77*** | 8.62*** |

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

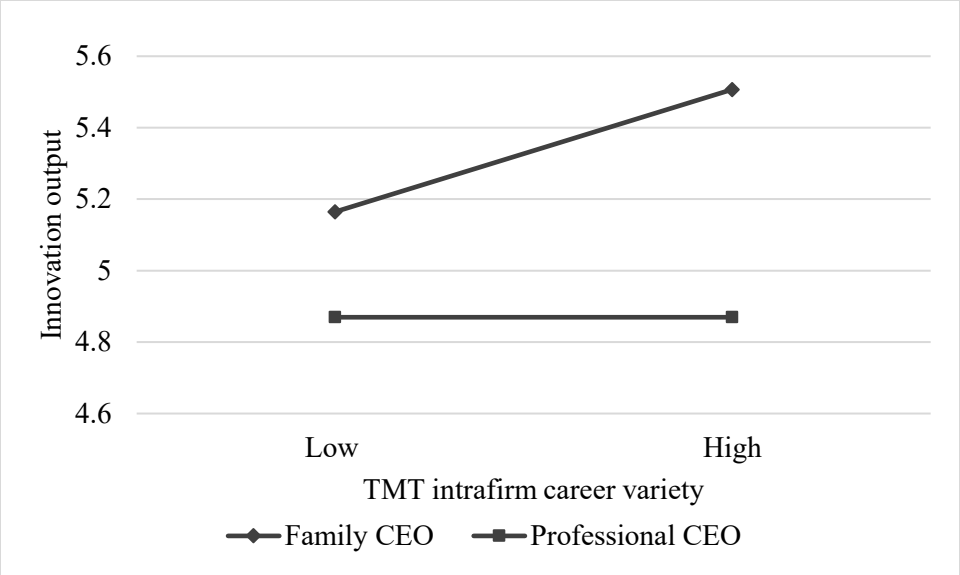


Figure 4.11 Family Firm Heterogeneity: Family CEO, TMT Intrafirm Career Variety and Innovation Output

## 4.5 Chapter Summary

This chapter presents a comprehensive review of methodology, statistical analyses, empirical results, and *post hoc* tests of hypotheses developed in Chapter III. The results provide strong evidence that a family CEO has a direct effect on firm innovation input and innovation output and that a family CEO positively moderates the relationship between TMT resources and firm innovation. In addition, findings marginally support that externally-linked TMT resources mediated the negative relationship between family CEO and innovation input. *Post hoc* tests conducted in this chapter explore a potential moderator that may influence the relationship between family CEO and TMT resources and examined family firm heterogeneity. Chapter V will discuss these results and their theoretical and practical implications.

# CHAPTER V

# DISCUSSION AND CONCLUSION

The purpose of this chapter is to provide a discussion of findings based upon results of the testing of hypothesized relationships in Chapter IV. Following the discussion of findings, this chapter presents contributions and limitations of this study. The chapter is organized into the following sections: (5.1) overview of the study, (5.2) discussion of the findings, (5.3) contributions and implications, (5.4) limitations and future research, and (5.5) conclusion.

## 5.1 Overview of the Study

Innovation is critical to firm growth, profitability, and survival (Crossan & Apaydin, 2010; Damapour, 1991; Kimberly, 1981), especially for firms in high-technology industries. Family business researchers suggest that family firms, as a ubiquitous presence around the world, behave distinctively from non-family firms regarding innovation (e.g., Block, 2012; Chrisman & Patel, 2012; Gómez-Mejía et al., 2014). Prior studies in family business describe a paradoxical phenomenon of family firm innovation, assuming that family firms are "unwilling yet able" to innovate (Chrisman et al., 2015) and suggest that family firms can "do more with less" (e.g., Duran et al., 2015). However, how family firms "do more with less" remains less clear.

The goal of this study is to further the understanding in this research stream. Employing a capability-based perspective, this research explores what unique resources

and capabilities arise when a family member takes the CEO position and how these resources and capabilities underlie firm innovation. Three research questions, outlined in Chapter I, guide the examinations conducted in this study. The first research question inquires "*Why does a family CEO have a distinctive impact on firm innovation?"* In pursuit of the answer to this research question, Chapter II of this study reviews family business literature with the aim to explore idiosyncratic resources arising from family involvement, especially when a family members takes the CEO position of a firm. Then, Chapter II presented a capability-based perspective of firm innovation to justify the idiosyncratic resources arising from the presence of family CEO have an impact on firm innovation, particularly through family CEOs' distinctive dynamic managerial capabilities manifested as their configuration and orchestration of TMT managerial resources.

The second research question of this study examines "*Compared to a professional CEO, how does a family CEO have a distinctive direct impact on firm innovation?*" In pursuit of the answer to this research question, Chapter III draws upon family business literature, distinguishing family management (i.e., family CEO) from other forms of family involvement (i.e., family ownership and other family members' involvement in TMT) and exploring family CEOs' distinctive direct impact on firm innovation. Hypothesis 1 and Hypothesis 2 in Chapter III are developed to examine family CEOs' direct impact on firm innovation.

The third research question of this study explores "*Compared to a professional CEO, how does a family CEO have a distinctive indirect impact on firm innovation?*" In pursuit of the answer to this research question, Chapter III employs a capability-based

perspective of firm innovation, exploring how family CEOs configure and orchestrate TMT resources distinctively and how family CEOs' idiosyncratic managerial capabilities, along with distinctive TMT managerial resources in these family-CEO-managed firms, have an impact on firm innovation. Hypotheses 3 through 8 in Chapter III are developed to examine family CEOs' distinctive configuration and orchestration of TMT managerial resources and how these idiosyncratic TMT resources have an impact on firm innovation.

The results of the testing of these hypotheses are presented in Chapter IV, providing insights into these research questions. Detailed explanation for the results for each hypothesis and their implications are presented below.

## 5.2 Discussion of the Findings

### 5.2.1 CEO Type and Firm Innovation

The first two hypotheses in this research examine family CEOs' direct impact on firm innovation. Hypothesis 1 is developed to examine family CEOs' direct impact on firm innovation input. Results of the analysis conducted in Chapter IV yield support for Hypothesis 1, suggesting that family-CEO-managed firms invest less in R&D than professional-CEO-managed firms. Family business literature argues that family involvement creates idiosyncratic resources and capabilities deeply embedded within the family, known as "familiness" (Habbershon & Williams, 1999; Habbershon et al., 2003). These unique resources, particularly generated through family involvement in top executive positions (Minichilli et al., 2010), can be either distinctive or constrictive (Habbershon et al., 2003). A family CEO, usually selected from a small pool of qualified candidates within the family (Schulze et al., 2001, 2003), has less diverse prior organizational experiences and external connections, thus, is less able to sense innovative

opportunities than a professional CEO. In addition, a family CEO with the propensity to preserve their gained emotional attachments usually employs family-related reasoning processes to make decisions on opportunity seizing, leading to conservative innovation investments. In accordance with these arguments, results of this study indicate that family-CEO-managed firms invest less on R&D than professional-CEO-managed firms.

Hypothesis 2 is developed to examine family CEOs' direct impact on firm innovation output. Results of the analysis conducted in Chapter IV yield support for Hypothesis 2: given innovation input, family-CEO-managed firms achieve greater innovation output than professional-CEO-managed firms. As mentioned previously, unique resources generated through family involvement in top executive positions (Minichilli et al., 2010) can be either distinctive or constrictive (Habbershon et al., 2003). When a family member takes the CEO position, the interactions between the family, the business, and the individual give rise to idiosyncratic, firm-specific, and tacit knowledge less transferable to other firms (Minichille et al., 2010; Sirmon & Hitt, 2003). A distinctive and hard-to-imitate organizational culture also can be created by a family CEO, through which knowledge sharing activities are encouraged and a stewardship atmosphere is fostered (Carnes & Ireland, 2013; Davis et al., 2010). Family involvement in management creates efficient routines, through which current activities can be extended into new streams and the resource-enhancing capabilities can be enhanced. These unique constructive resources associated with a family CEO are critical to facilitate resources recombination and integration, through which R&D investments are converted into increased sales in an effective way. In accordance with these arguments, results of this study indicate that, even though family-CEO-managed firms are less able to sense

innovative opportunities and have lower levels of innovation input than professional-CEO-managed firms, they are more able to convert innovation input into innovation output than their professional-CEO-managed counterparts.

Using a family firm subsample, this research conducts *post hoc* tests in Chapter IV to compare innovation of family-CEO-managed with that of professional-CEO-managed family firms. The hypothesized family CEOs' direct impacts on innovation input and innovation output keep consistent. Findings in the *post hoc* tests suggest that family firms managed by a family CEO invest less than family firms managed by a professional CEO. Given innovation input, firms managed by a family CEO have greater innovation output than their family counterparts managed by a professional CEO. Taken together, this research concludes that family CEO has a direct impact on firm innovation. Specifically, family-CEO-managed firms have less innovation input but greater innovation output than professional-CEO-managed family and non-family firms, which aligns with findings of prior studies.

### 5.2.2 Family CEOs' Configuration of TMT Resources and Firm Innovation

Hypotheses 3 through 6 explore family CEO's configuration of TMT resources and examine how TMT resources mediate the relationship between family CEO and firm innovation. The CEO has a leading role in firm innovation (Hambrick, 1994), primarily through the centrality of their leadership and the interactions with other TMT members (Ling et al., 2008; Peterson et al., 2003). In addition to their leading role and direct impacts on firm innovation, CEOs' dynamic managerial capabilities underlying firm innovation can be manifested as their configuration of TMT competencies (Kor & Mesko, 2013). This configuration role is facilitated through CEOs' managerial discretion

on TMT members' recruitment, promotion, and retention. A family CEO, compared with a professional CEO, configures TMT competencies distinctively, leading to unique TMT resource compositions that underpin firm innovation input and output.

Hypothesis 3 explores family CEOs' impact on externally-linked TMT resource configuration and examines the mediation effect of externally-linked TMT resources concerning the negative relationship between family CEO and innovation input. The analysis conducted in Chapter IV provides supporting findings for Hypothesis 3. Using two proxies of externally-linked TMT resources, results indicate that family-CEO-managed firms have lower levels of TMT external connections and prior organizational experiences than professional-CEO-managed firms and that TMT external connections are positively associated with firm innovation input. According to family business literature, family CEOs usually have strong emotional attachments with their firms, such as their belonging, affect, sense of family legacy, and security of career in the firm (Chrisman et al., 2012), which shape their decisions on TMT members' recruitment and promotion. Furthermore, family CEOs tend to have intentions to sustain family control through transgenerational succession. These intentions limit the attractiveness of these firms to talent managers and impede the recruitment of competent top managers with diverse career experiences and broad external connections (Chrisman et al., 2014). Thus, family-CEO-managed firms may be less able to recruit TMT members with broad external connections while these external connections are beneficial to sensing and seizing innovation opportunities and to higher levels of innovation input. Taken together, TMT external connections, as a proxy of externally-linked TMT resources, partially mediate the negative relationship between family CEO and firm innovation input. TMT

prior organizational experiences, while negatively associated with family CEO, have no significant relationship with innovation input (the discussion of further examination for this nonsignificant relationship is provided in Section 5.2.3).

Hypothesis 4 explores family CEOs' configuration of internally-linked TMT resources and examines the mediation effect of internally-linked TMT resources concerning the positive relationship between family CEO and innovation output. Family CEOs have strong identification with their firms and prefer farsighted investments and on-the-job learning (Davis et al., 2010; Eddleston & Kellermans, 2007; Miller & Le Breton-Miller, 2006). In accordance to this strong family identity, family CEOs have salient intentions to provide supportive behavior toward non-family managers, which can boost non-family managers' sentimental bonds with the firm (Davis, Schoorman, & Donaldson, 1997) and enhance their on-the-job learning. Using three proxies of internally-linked TMT resources (i.e., TMT firm tenure, TMT team tenure, and TMT intrafirm career variety), results in Chapter IV do not support Hypothesis 4 — internally-linked TMT resources do not mediate the positive relationship between family CEO and firm innovation output. Particularly, findings indicate that family CEOs are not significantly related to TMT firm/team tenure and TMT intrafirm career variety; these internally-linked TMT resources are not significantly associated with innovation output. *Post hoc* tests were conducted to advance the understanding of non-significant relationships between family CEO and internally-linked TMT resources, which are discussed below. The discussion of further exploration of non-significant relationship between internally-linked TMT resources and innovation output is presented in Section 5.2.3.

Concerning the relationship between family CEO and TMT resource configuration, this research conducted *post hoc* tests to explore the potential moderator of CEO duality as Chairman. When a CEO takes a dual role of Chairman, salient power associated with CEO duality enables the CEO to preserve the emotional attachments within the firm (Boyd, 1995; Combs, Ketchen, Perryman & Donahue, 2007) and to influence the recruitment process of TMT members to a great extent. Results of *post hoc* tests conducted in Chapter IV indicate that TMT members in firms managed by a family CEO who also has a dual role of Chairman have lower levels of external connections than those in other firms. On the other hand, CEO duality can foster a stewardship atmosphere within the firm (Boyd, 1995) and influence TMT promotion and retention, leading to enriched TMT internally-linked resources such as diverse TMT firm tenure, team tenure and intrafirm career variety. Results of *post hoc* tests indicate that, in firms managed by a family CEO who also has a dual role of Chairman, TMT members have more diverse firm tenure and team tenure but lower levels of intrafirm career variety. Taken together, on the one hand, TMTs in family-CEO-managed firms have distinctive externally-linked resource configurations with the comparison to those in professional-CEO-managed firms. On the other hand, internally-linked TMT resource configurations are distinctive in family-CEO-managed firms only when the family CEO has a dual role of Chairman.

Hypothesis 5 and Hypothesis 6 are developed to examine the moderating effect of family involvement in TMT on the relationship between family CEO and TMT resource configuration. Results do not support the hypothesized moderating effect. The non-significant results may be caused by the fact that only a small proportion of firms (specifically 15 firms) has family involvement in TMT. As a remedy to this issue, this

research employed a family firm subsample, comparing family-CEO-managed firms with professional-CEO-managed family firms, to test Hypothesis 5 and Hypothesis 6. Finding suggest that family firms are less able to recruit TMT members with external connections when other family members are involved in TMT, regardless of whether a family-CEO-managed or professional-CEO-managed firm. The tests also report a positive interaction effect of family CEO and family involvement in TMT on TMT team tenure, suggesting that family firms managed by a family CEO have more diverse TMT team tenure when other family members are involved in TMT. Using a family firm subsample and taking TMT team tenure as a proxy of internally-linked TMT resources, Hypothesis 6 is supported: TMTs in family-CEO-managed firms have distinctive internally-linked resource configurations by the comparison with those in professional-CEO-managed family firms.

### 5.2.3 Family CEOs' Orchestration of TMT Resources and Firm Innovation

Hypothesis 7 and Hypothesis 8 are developed to explore the family CEO's orchestration of TMT resources and to examine how the family CEO moderates the relationship between TMT resources and firm innovation. CEOs' orchestration of TMT competencies describes the process through which CEOs, acting like orchestra conductors, elicit harmonious performance from TMT members and integrate specialized knowledge to achieve better performance (Kor & Mesko, 2013). Family CEOs, compared to their professional counterparts, have salient power, legitimacy, and discretion to orchestrate TMT competencies to achieve better firm-level outcomes. Besides, family CEOs can create a stewardship atmosphere within the firm and employ generalized

exchange systems to orchestrate social exchange activities within the firm (Long & Mathews, 2011), yielding better firm-level consequences.

Results conducted in Chapter IV indicate that even though TMT prior organizational experiences are not significantly related to innovation input in general, such externally-linked TMT resources have a significant contribution to innovation input when a family member takes the CEO position. The findings suggest that family CEOs, unlike their professional counterparts, can orchestrate TMT prior organizational experiences in an effective way, such that TMT members can utilize their prior organizational connections to sense and seize innovative opportunities. Such a positive orchestration effect found in family-CEO-managed firms is not observed in professional-CEO-managed firms.

Results conducted in Chapter IV also provide evidence that even though TMT firm/team tenure and intrafirm career variety are not significantly related to innovation output, such internally-linked TMT resources are beneficial to innovation output when a family member takes the CEO position. The findings suggest that family CEOs can orchestrate TMT firm/team tenure and intrafirm career variety in a more effective way. Thus, firm-specific tacit knowledge resources that TMT members have gained during their retention within a family-CEO-managed firm can be synergistically coordinated and recombined. Consequently, innovation input can be converted into greater innovation output (i.e., increased sales) in family-CEO-managed firms than in professional-CEO-managed firms.

Using family firm subsample, family CEOs' distinctive effects on TMT resource orchestration remain consistent. Even though the relationship between TMT prior

organizational experiences and innovation input is not significant in family firms, such externally-linked TMT resources are positively related to innovation input in firms managed by a family CEO. Concerning internally-linked TMT resources, even though TMT intrafirm career variety is not significantly related to innovation output in family firms, such internally-linked TMT resources are beneficial to innovation output in family-CEO-managed firms while not in professional-CEO-managed family firms. The findings suggest that family CEOs orchestrate TMT prior organizational experiences and intrafirm career variety in a distinctive way by the comparison with their professional counterparts. To summarize, a family CEO orchestrates TMT members' prior organizational experiences and their diverse intrafirm knowledge to sense and seize innovation opportunities and to deliver enhanced innovation output.

### 5.2.4 Integrated Interpretation of the Findings

This research hypothesizes a negative direct impact of family CEO on firm innovation input and a positive direct impact of family CEO on firm innovation output due to unique resource constraints and endowments associated with family management. Empirical results support such hypothesized relationships, finding that family-CEO-managed firms have less innovation input and more innovation output than professional-CEO-managed family and non-family firms.

This research also argues that family CEOs have distinctive managerial capabilities, manifested as their configuration and orchestration of TMT resources. In addition to the direct impact, family CEOs have an impact on externally-linked and internally-linked TMT resource configurations that mediate the relationship between family CEO and firm innovation. Empirical results provide evidence that externally-

linked TMT resources, measured by TMT external connections, partially mediate the negative relationship between family CEO and innovation input. While empirical results do not support that family CEO is positively related to internally-linked TMT resources, findings suggest that the relationship between family CEO and internally-linked TMT resources is contingent upon CEO duality as Chairman. For family firms, this relationship is also contingent upon other family members' involvement in TMT — family involvement in TMT positively moderates the relationship between family CEO and internally-linked TMT resources (using TMT team tenure as a proxy).

Given TMT resource configurations, family CEOs orchestrate TMT resources distinctively. While TMT prior organizational experiences may not be valuable resources for professional-CEO-managed firms to sense and seize innovative opportunities, family CEOs can create value from these resources, which are beneficial to innovation input. Similarly, findings suggest that TMT firm tenure, team tenure, and intrafirm career variety are not valuable resources for professional-CEO-managed firms to achieve innovation output. However, these internally-linked TMT resources contribute to innovation output only in family-CEO-managed firms, while such effect is not found in professional-CEO-managed family and nonfamily firms.

## 5.3 Contributions and Implications

### 5.3.1 Theoretical Contributions

This research makes several primary contributions to the literature. First, this research contributes to the dynamic managerial capability approach of the study of firm innovation. Recent literature employing a capability-based perspective argues that a firm's competitive advantage primarily lies in the firm's dynamic and higher-order

capabilities (Leiblein, 2011) and idiosyncratic capabilities associated with top managers predict a firm's dynamic capabilities of opportunity sensing, seizing, and resource transformation (Kor & Mesko, 2013; Teece, 2007). However, empirical investigation on higher-order managerial capabilities underlying firm innovation is limited. Drawing on an innovation input-output model, this research identifies various TMT managerial resources underlying innovation input and output to advance the understanding in this research stream. Furthermore, this research makes distinctions between managerial resources and managerial capabilities. While resources broadly refer to all of a firm's assets and organizational attributes (Barney, 1991), capabilities as a special type of resources are generated by combining and re-combining resources to make a firm dynamic (Amit & Schoemaker, 1993). Drawing on this distinction, this research conceptualizes CEOs' managerial capabilities by examining CEOs' impact on TMT resource configuration and orchestration. For instance, family-CEO-managed firms have unique TMT resource constraints; however, family CEOs can orchestrate these resources in a distinctive way to achieve better outcomes in terms of firm innovation input and output. In doing so, this research provides evidence that CEOs' managerial capabilities are higher-order capabilities, which are more firm-specific and deeply embedded in the firm (Makadok, 2001) and reflect the firms' ability of combining and re-combining TMT managerial resources to make a firm dynamic (Amit & Schoemaker, 1993).

Second, this research employs the RBV in general, and a capability-based perspective in particular, to advance the understanding of family firm innovation. This research expands on current approaches to the study of family business by examining what distinctive resources and capabilities underlying firm innovation are generated

through family management (i.e., family CEO) and why and how these resources and capabilities impact firm innovation. Family business researchers drawing on the RBV suggest that the deep embeddedness of the family in the business gives rise to unique resources and capabilities, conceptualized as familiness (e.g., Habbershon & Williams, 1999; Habbershon et al., 2003). Familiness, however, may be difficult to capture (Ensley & Pearson, 2005). Prior studies in family business suggest that familiness takes various forms, such as idiosyncratic firm-specific human capital, strong social capital, salient family firm identity, and distinctive resource re-bundling capabilities (e.g., Carnes & Ireland, 2013; Pearson et al., 2008; Sirmon & Hitt, 2003; Zellweger et al., 2010). Empirical efforts in this research stream provide evidence that family firms behave or perform differently from nonfamily firms and attribute the differences partially to familiness (e.g., Ensley & Pearson, 2005; Minichille et al., 2010). This research explores distinctive managerial capabilities associated with family CEOs, especially family CEOs' distinctive way to configure and orchestrate TMT resources that underlie firm innovation. In so doing, this research is among the rare efforts, if not the only, to examine unique higher-order capabilities associated with family management. Findings in this research create a foundation upon which other studies can explore what efficient routines and enriched activities underlying firm innovation are developed and/or how the presence of family CEO creates synergies and facilitates generalized social exchange within TMT.

Third, this research answers calls for deeper investigation of family firm heterogeneity caused by distinctive efforts and abilities, which arise from various forms of family involvement (Gedajlovic et al., 2012; Chrisman et al., 2013). Prior literature on family businesses dominantly draws on agency theory and/or behavioral agency theory,

suggesting that family firms frame innovation as potential losses or gains to their socioemotional wealth (Chrisman & Patel, 2012; Gómez-Mejía et al., 2014). These studies attribute low levels of family firm innovation to controlling families' unwillingness to innovation, thus, revealing a paradoxical phenomenon in relation to family firm innovation: unwilling yet able to innovate (De Massis et al., 2015; Duran et al., 2015). However, heterogeneity exists widely in family firms in terms of both willingness and ability (Chua et al., 2012; Gedajlovic et al., 2012). This research selects a specific empirical context, publicly traded firms in high-technology manufacturing industries, where innovation has the most importance (Gómez-Mejía et al., 2014). In so doing, this research limits the variance of firm innovation caused by owner-managers' (un)willingness to innovate to a great extent. Findings of this research illustrate that family firms are heterogeneous in terms of innovation resources and capabilities. Instead of assuming that family firms are unwilling to innovate, this research provides evidence that family firms managed by family CEOs have unique resource constraints. Consequently, these firms are less able to sense and seize innovation opportunities and invest less on innovation input. This research also does not assume that family firms are able to innovate homogeneously. Instead, findings in this research indicate that family firms managed by family CEOs have distinctive resource endowments and superior capabilities. As a result, these managerial resources and capabilities help the firm to convert innovation input into increased sales in a more effective way, such that these family firms can do more with less. In so doing, this research responds to calls for further efforts to advance knowledge about family firm heterogeneity (Chua et al., 2012) and helps to form an integrated picture of family firm innovation (Duran et al., 2015) by

exploring family firms' inferior or superior capabilities concerning innovation input and output.

### 5.3.2 Practical Implications

This research has practical implications for both family and nonfamily firm innovation. First, this research indicates that firm innovation has multi-facets, denoting both a set of activities through which a firm identifies new opportunities (Thompson, 1965) and a variety of outputs (Kimberly, 1981). Taking this multi-faceted perspective, innovation is more than R&D investment. After the R&D investment decisions have been made to seize identified new opportunities, resources and assets are recombined and orchestrated within the firm and firm-specific routines and procedures are framed and redeveloped, which are critical to achieve superior innovation output. Findings of this research suggest that even though family firms managed by family CEOs are inferior in sensing and seizing new opportunities and have lower levels of innovation input, family-CEO-managed firms are superior in terms of innovation output. As a result, these firms convert innovation input into increased sales in a more effective way. Thus, instead of focusing on investing less or more on innovation, firms may emphasize how to convert innovation input into innovation output through resource/asset recombination and orchestration. For instance, both family and nonfamily firms may benefit from the creation of a stewardship-like atmosphere within the firm (Madison, 2014), which can facilitate generalized social exchanges within the firm (Long & Mathews, 2011) and foster high-levels of trust to achieve greater resource recombination and technology/knowledge transferring. Furthermore, family and nonfamily firm may highlight firm leaders' central role in coordinating and orchestrating diverse TMT, as

well as R&D teams, which are critical to the formation of new product development routines and keeping the firm dynamic (Augier & Teece, 2009).

Second, findings in this research indicate that TMT resources and competencies have various dimensions, which affect firm innovation input and output differently. Prior studies on human capital literature distinguish the boundaryless career and within-organization career (DeFillippi & Arthur, 1994; O'Mahony & Bechky, 2006; Salvato, Minichilli, & Piccarreta, 2012). Boundaryless career refers to career paths beyond the boundaries of single employment settings (DeFillippi & Arthur, 1994), which is critical to accumulating non-firm-specific knowledge and building inter-organizational networks (Crossland et al., 2014). As a contrast, intra-firm career refers to vertical and/or horizontal career paths with a single employer (O'Mahony & Bechky, 2006), which is beneficial to firm-specific knowledge accumulation. Findings in this research indicate that TMT members with more externally-linked resources gained through a boundaryless career path are critical for high-technology firms to identify innovation opportunities and to enhance their competent innovation status in the industry. On the other hand, TMT members with salient internally-linked resources gained through within-organization career path are valuable as well, especially for high-technology firms whose goal is to improve the conversion from R&D investments into firm sales; however, the valence of these TMT resources is contingent upon the CEO's managerial discretion to a great extent. Thus, instead of exploring universal characteristics associated with high-performed TMT, both family and nonfamily firms may build their TMT with unique compositions aligned with the innovation strategies that the firm pursues.

Third, this research indicates that CEOs influence TMT competencies during two stages: TMT members' recruitment and TMT members' promotion and retention. Family business studies suggest that the presence of family CEO in family firms may negatively influence TMT recruitment and result in less talented top managers being hired by these firms (Memili, Chrisman, & Chua, 2011). Whereas, family CEOs can enhance these TMT members' internally-linked resources and enrich their firm-specific knowledge of the firm during their tenure. Thus, even though less likely to hire high profile top managers, family-CEO-managed firms can nurture a management cadre internally and build competent professional executive teams eventually through TMT resource configuration and orchestration. The findings also offer insights that boundaryless career paths and within-organization career paths have distinctive effects on firm innovation input and output. For instance, family and nonfamily firm may explore the within-organization career routes of their managers to achieve diverse firm-specific knowledge within the TMT on the one hand and to develop a shared language within the TMT on the other hand, both of which are critical to the innovation input-output conversion.

## 5.4 Limitations and Future Research

While findings in this research provide primary contributions to the study of family business and the literature of firm innovation, there are several limitations that may limit the interpretation of the findings. Addressing these limitations not only helps to represent the boundaries of this research but also provide directions for future effort.

First, this research uses firms in narrow industry sections — high-technology manufacturing industries with three-digit SIC codes 357, 365, 366, 367, 381, 382, 384, and 386 — to answer the research questions. This sampling design is used in studies

exploring firm innovation, based on the justification that a firm's ability to create and commercialize innovations quickly and efficiently is critical to the firm's survival and profitability (Gómez-Mejía et al., 2014; Li et al., 2008). Using narrow industry sections helps to control the great variance caused by diverse innovation patterns associated with a variety of industries, and, thus, can enhance the reliability of the findings. However, this approach has limitations given the potentially unique influence of family involvement within this industry may limit generalizability. In addition, although using this sampling design helps to control the variance of innovation patterns caused by a wide range of industries, the sample firms are diverse. Taking firm size — one frequently examined factor for product innovation and the allocation of R&D investment (Cohen & Klepper, 1996; Ettlie & Rubenstein, 1987) — as an example, total assets of sample firms used in this research range from a minimum of 0.085 million to a maximum of 129 million. Nevertheless, research using other sampling frames is needed to confirm the extent to which results are generalizable. Furthermore, even though a preliminary power analysis conducted before the data collection suggested that the number of observations ranging between 2063 and 523 can decrease the probability of Type II error to 0.1 (assuming that the effect size ranges between 0.1 and 0.2), the empirical results of this study report that the effect size in some models is lower than what was assumed. In this study, the number of observations changes across models and is even dramatically decreased in some models. The low effect size and/or a small number of observations in these models indicates the increased probability of Type II error. A study with an increased sample size could enhance the power of the test.

Second, this research draws on dynamic capability literature and applies a capability-based view of innovation within the context of family firms. This research examines the distinctiveness of the configuration and orchestration of TMT managerial resources in family-CEO-managed firms by comparison with those in professional-CEO-managed firms and infer that family-CEO-managed firms have superior or inferior managerial capabilities. Therefore, this research does not empirically measure CEO's managerial capabilities in a direct way in this research. Further, consider the measurement of TMT managerial resources, prior literature suggests that human capital, social capital and cognition associated with top managers are micro-foundations of firm dynamic capabilities (Crossan & Apaydin, 2010; Helfat & Martin, 2015; Teece, 2007). Following this conceptual framework, this research explores empirical measures of TMT managerial resources that underlie firm innovation. This research employs top managers' prior organizational experiences and external connections as proxies of externally-linked TMT resources to capture the effect of top managers' social connections on firm innovation input. Firm tenure, team tenure and intrafirm career variety were used as proxies of internally-linked TMT managerial resources to capture the effect of firm-specific knowledge on firm innovation output. It is possible that some of the results could vary by the choice of measurement of TMT resources. Further research exploring a more direct and/or comprehensive measure of TMT resources could contribute to the understanding of dynamic managerial resources that underlie firm innovation. For instance, a comprehensive measure of TMT diversity (e.g., including tenure diversity, functional background diversity, age diversity, education diversity, and gender diversity)

and a direct measure of TMT cross-department communication or cross-industry experiences may provide new research insights.

Another limitation is that this research focuses on exploring the distinctiveness of family-CEO-managed firms' innovation ability while taking their willingness to innovate as a given. The justification is based on the fact that innovation is critical to firm survival and profitability especially for firms in high-technology industries. Family firms' underinvestment on R&D may lead to not only financial losses but also socioemotional losses to the controlling family (Gómez-Mejía et al., 2014); thus, family firms' unwillingness to innovation is largely mitigated for this reason. However, family firms' willingness to innovate still varies among firms in high-technology industries (Gómez-Mejía et al., 2014). Drawing on behavioral agency theory and assuming firm innovation ability is given, the majority of family business literature argues that family firms' willingness to innovate largely contingents upon the controlling families' vision of the firm, the use of corporate governance mechanism to monitor, and the pressure arising from the firms' performance gap or the competitors' innovation ambitions (Chen & Hsu, 2009; Chrisman & Patel, 2012; Gómez-Mejía et al., 2014). Empirical findings in the behavioral agency stream of study help to identify several contingency factors, such as performance hazard and institutional ownership, and researchers attribute the moderation effect to the variation of family firms' willingness to innovate (Chrisman & Patel, 2012; Gómez-Mejía et al., 2014). Nevertheless, firm behavior and performance are driven by both effort and ability (Gedajlovic et al., 2012). Future studies are needed to build an integrated model to examine the distinctiveness caused by both effort and ability associated with family firm innovation.

This research distinguishes the family CEO, a critical component of family involvement, from family ownership and other family members' involvement in TMT and measures family CEO as a binary variable. However, family CEOs are heterogeneous as well. Prior studies find that family-related features associated with family CEO, such as founder family CEO, later generation family CEO, and CEO duality, can cause variations regarding both firm behavior and performance (Chen & Hsu, 2009; Miller et al., 2007, 2011). For instance, Miller and colleagues (2011) find that firms managed by family-owner CEOs are more likely to take conservative strategies than firms managed by family-founder CEOs but the former does not underperform. Whereas, later generation CEOs can achieve enriching work experiences through a strategic education design and early active involvement in the business, and, thus, help to sustain the firm's entrepreneurial legacy (Jaskiewicz et al., 2015). Research with the focus on exploring CEO heterogeneity caused by family involvement, such as founder CEO and later generation CEO, are potentially revealing in this research stream. Further, findings of this research do not provide evidence that other family members' involvement in TMT influences TMT resource configuration. Whereas, prior studies suggest that the presence of an apparent heir in the TMT has a positive effect on family firms' R&D investment (Chrisman & Patel, 2012). In addition to exploring family CEO heterogeneity, further efforts examining other forms of family involvement, such as generational involvement, the controlling family as the block holder, and/or family relationships, could provide new research insights.

## 5.5 Conclusion

Innovation is critical to firm growth, profitability, and survival (Crossan & Apaydin, 2010; Damapour, 1991; Kimberly, 1981). This research draws upon capability-based perspective to further the understanding of firm innovation in family business contexts. According to a capability-based perspective, firm innovation primarily contingent upon a firm's capability of sensing external innovation opportunities and deploying internal resources to seize these opportunities, which is largely determined by the top managers' managerial resources and capabilities (Adner & Helfat, 2003; Augier & Teece, 2009; Teece, 2012). The CEO of a firm, residing on the apex of the top management team, has a prominent role on firm innovation due to the fact that configuring and orchestrating TMT managerial resources is within the CEO's managerial discretion (Kor & Mesko, 2013). Thus, the characteristics associated with a CEO are among the key factors to understand a firm's adaptiveness to changing environment.

Family firms, as a ubiquitous presence around the world, behave distinctively in general and are specifically unique with respect to innovation-related behaviors (e.g., Anderson & Reeb, 2003; Chrisman et al., 2015; La Porta et al., 1999). The deep embeddedness of the family into the daily business practice, especially when a family member takes the CEO position, creates a variety of uniqueness in family firms (Chua et al., 1999, 2012; Habbershon et al., 2003; Minichilli et al., 2010). By extending the analytic perspective from an agency perspective to a capability-based perspective, this research explores distinctive capabilities and resources endowments or constraints generated through family management (i.e., family CEO). In addition to the findings suggesting that family CEOs have a direct impact on firm innovation, which is consistent

with prior findings (e.g., Duran et al., 2015), results in this research also indicate that family CEOs configure and orchestrate TMT managerial resources in a distinctive way, giving rise to unique managerial capabilities and resource configurations in family firms. Further efforts are needed to better understand manifestations of higher-order capabilities underlying firm innovation and how family involvement makes them distinctive; however, this study is one step in this direction.

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