Family Firm Radical Innovation: The Role of the Owner's Fearful Emotion on Maintaining SEW Endowment and Family Firm Resources

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Abstract

Family firms are found to behave in a risk-averse manner, and they normally pursue fewer innovation activities than their non-family counterparts. The reasons are commonly attributed to family owners' intentions to preserve SEW. However, there are two deficiencies with this perspective. The first is that whether family owners' apparent intention to preserve SEW matters depends on which dimensions of SEW are given importance by the family owners. Only in those firms where the fear of loss of particular dimensions of SEW is given importance should we expect implications for innovation behaviour. Second, even in the face of positive intentions to innovate given a desire to prevent the loss of SEW, the firm's ability and willingness to innovate is likely to be impacted by the resource stocks of the family firm. Both of these explanations have received very little investigation. Accordingly, and based on these two positions, the present study generates two investigations to observe family firm innovation by relying on an empirical sample of 412 completed surveys from family firms in the manufacturing industry in Chongqing, China. The first study investigates the relationship between family owners' fearful emotion placed on improper future maintenance of specific SEW dimensions and family firm innovativeness based on the negative emotion and problem-solving theory. On the assumption that family owners fearful of losing particular dimensions lead owners to make strategic decisions on supporting innovation activities, the authors found that fear of losing family patient capital and fear of losing renewal of family bonds are negatively and positively related to firm innovativeness, respectively. The findings of the first study extend the existing family firm innovation literature by showing that firm innovativeness can be changed when SEW is in a 'safe mode'. The finding of the first study enriches our understanding by highlighting that family owners' fearful emotion is important to influence firm innovative activities.

The second study investigates the relationship between family firm resources and family owners' willingness to pursue radical innovation based on the attention-based view. On the assumption that firm and family resources bear attention-guiding and behaviour-directing properties, the study finds that family idiosyncratic resources (family patient capital, family human capital and family social capital) have a major impact on family owners' willingness to pursue radical innovation while marketing resources (marketing knowledge, reputational resources, relational resources, technological resources, financial resources and human resources) are entirely unrelated to the family owners' willingness. The finding of the second

study extends the existing family firm innovation literature by evidencing the primacy of family idiosyncratic resources, and empirically demonstrating the effects among a group of family and firm resources overlooked by previous family firm studies. Contributions and implications from both studies are reported and discussed as well as important directions for future research.

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List of Abbreviations

R&D	Research & Development
RBV	Resource-Based View
SEW	Socioemotional Wealth
VIF	Variance Inflation Factor
OLS	Ordinary Least Square
GLS	Generalised Least Square
ML	Maximum Likelihood
KMO	Kaiser-Meyer-Olkin Measure
CFA	Confirmatory Factor Analysis
EFA	Exploratory Factor Analysis
CMV	Common Method Variance
KS	Kolmogorov-Smirnov
SW	Shapiro-Wilk
FC	Fear of Losing Family Control and Influence
FI	Fear of Losing Family Identity
FBST	Fear of Losing Family Binding Social Ties
FRFB	Fear of Losing Renewal of Family Bonds
EnD	Environmental Dynamism
EnF	Environmental Fitness
DoM	Domestic Environmental Munificence
AVE	Average Variance Extracted
CR	Composite Reliability

Declaration

I, the author of this thesis, confirm that this thesis has been conducted by the author, and the material contained in this thesis has not been formerly published nor submitted to any other institution. If material has been generated through joint work, my independent contribution has been clearly indicated.

Statement of Copyright

Qilin Hu

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Socioemotional wealth (SEW) represents the non-financial wealth of family firm and is identified as a prerequisite for family owners making strategic decisions to adopt radical innovation (Gomez-Mejia et al., 2007; Berrone et al., 2010). Many existing family firm innovation studies have demonstrated that family firms have strong intention to preserve SEW and avoid innovation activities which have a certain capacity to harm socioemotional wealth (e.g. Zahra, 2005; Chen & Hsu, 2009; Singh & Gaur, 2013). However, despite the SEW-derived logic, family firms can still make a large contribution to innovation based on competing evidence (Konig et al., 2013; Miller et al., 2015). Empirical evidence shows that over 50% of family firms made the majority of the contributions to innovation in European countries in 2015 (Rondi et al., 2015). Also, some previous studies contend that family firms have possibilities to innovate (Singh & Gaur, 2013; Kammerlander & Ganter, 2015). These conflicting observations and inconsistent findings encouraged scholars to search for factors in relation to family firm heterogeneity that can influence family firms to adopt radical innovation (Kotlar et al., 2013). We identified two factors which could be importantly related to family firm radical innovation activities – one is the dimensions of SEW and the other is the family firm's resources.

First, SEW is generally treated as a unidimensional construct according to the previous family firm innovation studies (e.g. Gomez-Mejia et al., 2007; Berrone et al., 2010), and the multidimensional nature is largely overlooked (Chrisman et al., 2015). The main argument among the existing studies lies in that the family owners' intention to preserve SEW will drive family firms to take fewer risks (Kellermanns et al., 2012). According to this argument, family firms could be expected to adopt few radical innovation activities because of the high level of risks and the degree of uncertainty generated from radical innovation can harm SEW endowment (De Massis et al., 2016). Still, some studies such as Chrisman & Patel (2012), Chua et al. (2012) and Cennamo et al. (2012) proposed that family firms generate different degrees of innovation intention while family owners are maintaining particular aspects of SEW. However, only a few existing family firm innovation studies discussed the effects between SEW dimensions and family firm innovation activities. The second consideration is the relationship between family firm resources and family owners' willingness to pursue radical innovation although this specific relationship has been widely reported among the studies of traditional firms (e.g. Morgan et al., 2006; Kyriakopoulos et al., 2016). However, the family firm resources have largely been overlooked while scholars have investigated family firm radical innovation activities. Family firm resources, such as family-based human assets (Sirmon & Hitt, 2003; Verbeke & Kano, 2012), family social capital (Lichtenthaler &

Muethel, 2012), and family patient capital (Hoffman et al., 2006) are vital to support family firms to achieve radical innovation success (Chua et al., 2012).

This study will investigate the factors which could influence family firm radical innovation activities by observing: (1) the relationship between family owners maintains particular socioemotional wealth dimensions and family firm innovativeness by employing negative emotion and problem-solving theory; and (2) the relationship between family firm resources and family owners' willingness to pursue radical innovation based on the attention-based view. In the beginning, we propose family owners' fearful emotion on maintaining specific SEW dimensions could drive family firms to support the different degree of innovation activities. This perspective intends to enrich the current understanding in which family firm innovativeness can change when SEW is safe and stable, which helps to create new insights to reconcile the relationship between SEW and family firm innovation activities. Moreover, we suggest that family firm resources can steer family owners' intention to pursue radical innovation. This relationship will extend the knowledge regarding family owners' willingness to adopt radical innovation which cannot only be influenced by intentions to preserve SEW but can also be influenced by family firm resources.

Chapter 1 will provide an overview of the present thesis with the research background and rationale of the research (1.2), research aims and objectives (1.3), description of the sample and contributions (1.4) and the overview of how the thesis is structured (1.5).

1.2 RESEARCH BACKGROUND AND RATIONALE

Family business is an ancient business type which is owned and managed by members of the same family or a small number of families, focusing on sustaining across generations (Chua et al., 1999). Family firms are different from traditional or non-family firms (Chua et al., 1999; Gomez-Mejia et al., 2007; Chrisman et al., 2012). A distinctive feature of family firms is that they have a strong intention to preserve family ownership and control and at the same time take fewer risks (Carney, 2005; Block, 2012). Moreover, radical innovation can create a radical shift from the firms' current status to a novel position; its ultimate intention is to introduce new technology combinations, new production lines, or new products (Anderson & Tushman, 1990). Such an innovation type is highly uncertain and dynamic; searching for novelty emerges by integrating state-of-the-art techniques with the existing products and services, and combining the contexts of external business environment (e.g. institutional environments including policies, legitimacy, law, and taste of consumers) (Cheng & Van de Ven, 1996; Freeman & Soete, 1997; De Massis, 2016). Many family firm innovation studies believe radical innovation could assist firms to gain a sustained competitive advantage and

help family firms take a big step forward in the current market (Konig et al., 2013; Uhlaner et al., 2013; Chrisman et al., 2015; De Massis et al., 2016)

For example, one of the advantages brought by radical innovation is known for increasing firms' ability to maintain market power and economic performance. According to Sharma and Lacey (2004), and Kyriakopoulos et al. (2016), radical innovation assists family firms to keep up with the pace of changing customer tastes and meanwhile target more potential market groups, which increases the degree of firm survival and may help firms take a leading position within an industry (see Tellis, 2000). Additionally, radical innovation can boost firms' market value by searching for a new trajectory to generate new products and destroy old ones (Srinivasan et al., 2002). The new products generated from radical innovation not only assist firms to stand out in the current industry and face less direct competition, but also demonstrate the market potential which will attract new business partners and customers (Chan et al., 2008).

According to existing studies, family firms are cautious about taking risks and adopt relatively less radical innovation activities than their non-family counterparts (e.g. Chen & Hsu, 2009; De Massis et al., 2012). One of the reasons could be that radical innovation contains a high degree of risk and uncertainty regarding launching new products and failure of services (Tellis, 2000), rendering organisational changes (Rubera & Kirca, 2012), changing family members' job control latitudes (Craig & Moores, 2006; De Massis et al., 2016), or involving external institutions in family ownership (Chrisman et al., 2015). These risks and uncertainties brought by radical innovation put family ownership and control at stake, which is contrary to family owners' willingness regarding preserving family ownership and control (Chua et al., 1999; Carney, 2005; Kellermanns et al., 2012; Chua et al., 2012). However, family firms are heterogeneous (Chua et al., 2012; Kotlar et al., 2013). Some existing family firm innovation studies still demonstrate that family firms can indulge in risk-taking behaviour and adopt radical innovation (e.g. Sharma & Salvato, 2011; Konig et al., 2013; Covin et al., 2016). These studies motivate scholars to discover the possible *factors that can influence family firm innovation activities.*

Most of the existing literature focused on the characteristics of family firms, in particular, the intentions to preserve and protect socioemotional wealth (SEW) (Gomez-Mejia et al., 2007; De Massis et al., 2012; Chrisman et al., 2013; Matzler et al., 2015). SEW is defined as the nonfinancial wealth held by family firms (Gomez-Mejia et al., 2007; Berrone et al., 2010). It covers five fundamental dimensions: family control and influence, family identity, emotional attachment among family members, bonding social ties and renewal of family bonds (Berrone et al., 2012). SEW demonstrates the intention of family owners to maintain a level

of harmony (Gomez-Mejia et al., 2007; Berrone et al., 2010; Chua et al., 2018). Gomez-Mejia et al. (2007) point out two different situations in relation to how SEW guides family firms to innovate. First, when SEW is stably maintained (preserve mode), family firms avoid taking risks which can harm and produce danger to SEW endowment preservation. Because radical innovation contains great uncertainties in which an innovation failure might ruin a family legacy, family firms seldom consider radical innovation in their strategic decisions. Second, when SEW is at loss or risk of loss (losing mode), family firms will innovate radically for the sake of saving SEW endowment.

However, the motivation to adopt radical innovation is complex and unpredictable in family firms (Kotlar et al., 2018). Family firms' innovation activities range across different levels. Sometimes, family firms are unwilling to adopt radical innovation, but sometimes family firms can innovate intensively (Rondi et al., 2018). According to Rondi et al. (2018), family firms contributed the major innovation efforts (around 50%) in European countries in 2015. Hence, the unidimensional SEW might not play a critical role in explaining why some family firms adopt radical innovation. Additionally, it is unusual to see the reason for adopting radical innovation is only attributed to which SEW is constantly in the losing mode.

What factors drive family firms to adopt radical innovation? We identify two points of view to answer this question. First, it is critical to investigate SEW dimensions in order to generate new insights into innovation activities in family firms. Chrisman and Patel (2012) found family firms could enhance family firms' innovation activities under two particular situations. Firstly, when firm performance is below the aspiration of family owners, family owners could increase R&D spending. Generally, family firm performance is closely related to firm survival (Sciascia et al., 2015). When firm performance is below the owners' expectations, it could increase family owners' intention to preserve SEW for the purpose of preventing non-economic wealth from losing in the future (Chrisman & Patel, 2012). Secondly, when family owners focus on transgenerational control (preparing to hand the current business down to next generational leaders), family owners will be farsighted – increasing their investment horizon and wish to receive benefits from a long-term return. The efforts made by family owners show that the family owners expect the business can operate through generations. Chrisman and Patel's (2012) study demonstrates the increase of family innovation activities is guided by the degree to which family owners sensed the SEW would be in danger; this study also shows family firm innovation activities could be enhanced when family owners draw a high degree of intention to maintain a specific SEW dimension – renewal of the family bonds dimension.

Second, the strategic directions towards innovation are guided by family owners' willingness to innovate (De Massis et al., 2014). This aspect is different from the decision-making process in non-family counterparts in which the process of strategic decision making and implication should receive confirmation from different layers within an organisation (Sorensen & Stuart, 2000). Family owners have the power to jump over the bureaucratic decision-making process and make relatively faster process on strategic decision making and implementation (Veider & Matzler, 2015). Once family firms decide to adopt innovation activities, they have higher speed and strong stamina towards strategic implementation compared to non-family firms (Konig et al., 2013). De Massis et al. (2014) suggested that family owners' willingness to innovate is guided by SEW endowment. While family owners are gradually concentrating on preserving SEW, they could be less willing to adopt radical innovation (Berrone et al., 2012). It is vital to find out what factors can influence family owners' willingness to innovate besides SEW.

Factors such as firm resources might be critical to steering family owners' attention to innovation (De Massis et al., 2014). Among the traditional firm studies, according to Morgan et al. (2003), marketing resources can draw firms' attention to adopting innovation activities. For example, market knowledge is developed and accumulated while firms are interacting with market audiences (e.g. competitors, consumers, customers, business partners and suppliers). Market knowledge covers the business history, knowledge of competitors and experience of launching products, which create a market picture for owners and managers to inspect and target new market segments (Kyriakopoulos et al., 2016). Market knowledge draws managers' attention toward pursuing radical innovation (Kyriakopoulos et al., 2016). In the family firm context, marketing resources could influence family owners' willingness to pursue radical innovation. In addition, family idiosyncratic resources were found to be associated with family firm radical innovation activities (Sirmon & Hitt, 2003; Hoffman et al., 2006). For instance, family patient capital is accumulated through internal financing activities in family firms (Sirmon & Hitt, 2003). A distinctive feature of patient capital is that it has a non-specified date of return and aims to invest in receiving benefits from the long-term (Hoffman et al., 2006). Continuous accumulating of patient capital can shape a family owner's investment horizon towards the long-term (Sirmon & Hitt, 2003), which could connect to family owners' willingness to pursue radical innovation.

However, these two views are largely overlooked by previous family firm innovation studies. Firstly, existing studies treated SEW as a unidimensional construct while observing family firm innovation activities (e.g. Gomez-Mejia et al., 2007; Kraiczy et al., 2014). As a result, when SEW is safe and stable, SEW is always be found to be negatively associated with family firm innovation activities. According to Berrone et al. (2010), family firms could pay

greater attention to maintaining SEW while family members are involved in ownership, governance and management. In this case, family involvement would result in fewer innovation activities in family firms. However, some studies found that family involvement is positively related to innovation outcomes (Matzler et al., 2015), ability to sense opportunities (Lichtenthaler & Muethel, 2012), and entrepreneurship behaviour (Le Breton-Miller et al., 2015). Hence, conflict exists when investigating family involvement and family firm innovation activities.

Secondly, firm resources are defined as a combination between types of resources held by a firm and specific firm's characteristics, which are valuable, rare, inimitable, and non-substitutable for a firm to acquire sustained competitive advantages (Barney, 1991). The firm resources can also be identified as stocks of available factors that could be converted into new values adding to the final products or services (Bakar & Ahmad, 2010). Adopting radical innovation requires firms to have a certain degree of resources (e.g. knowledge, technological resources, financial resources and relational resources) to support the innovation process (Vicky et al., 2009; Bicen & Johnson, 2015). To date, only a few family firm radical innovation studies have investigated family idiosyncratic resources, and family firm innovation activities (e.g. Sirmon & Hitt, 2003; Hoffman et al., 2006) since the type of resources as defined by Sirmon and Hitt (2003). Moreover, marketing resources, as a part of firm resources, were barely discussed along with family firm innovation activities in previous studies.

1.3 RESEARCH AIMS AND RESEARCH QUESTIONS

The present study has one major aim: *to understand why family firms have a different degree of intentions to adopt radical innovation.*

To achieve this aim, this study addresses two research questions:

1. *Does the family owners' fear of future loss of SEW in different dimensions generate different impact on the innovativeness of family firms?*
2. *What firm resources can direct family owners' willingness towards pursuing radical innovation?*

In order to extend the knowledge and enrich the understanding of family firm radical innovation, two studies are created to observe family firm innovation behaviours (firm innovativeness and family owners' willingness to pursue radical innovation) which are related to radical innovation adoption. In the first study, we theorise and examine the relationship between SEW dimensions and firm innovativeness by employing negative emotion and problem-solving theory. The purpose of the first study is to extend the understanding of how

firm innovativeness would be influenced by SEW. Focusing on the aim and purpose of the first study, we argue that SEW dimensions have different effects to impact on firm innovativeness. Chrisman and Patel's (2012) finding demonstrates the change of family innovation behaviour when family owners steer their attention on certain SEW dimensions. Therefore, there is a possibility that the firm innovativeness could also be influenced when SEW is in the preserve mode. Moreover, according to George and Zhou (2007), when an individual draws attention to maintaining a specific event, it would induce the individual's degree of fear and anxiety regarding a possible occasion that the event will be improperly maintained in the future. The degree of fearful emotion motivates the individual to create problem-solving strategies to tackle the unexpected results happening in the future (Foo, 2009). The same mechanism can apply to the relationship between the fear of losing SEW dimensions and firm innovativeness. This study responds to the call issued by Berrone et al. (2012), Chrisman and Patel (2012) and Chua et al. (2018) for SEW dimensions could generate different impacts on family firm innovation activities.

The second study theorises and examines how firm resources can direct family owners' attention to the pursuit of radical innovation by employing the attention-based view. The main aim of the second study research is to understand how family owners are motivated to conduct radical innovation. The purpose of this study is to search for attentive factors which can direct family owners' willingness to pursue radical innovation other than SEW. Resources, such as marketing resources, are found to draw the owners' and managers' attention to pursue radical innovation (Kyriakopoulos et al., 2016). We apply the same logic to the second study. Additionally, since family firm resources are not clearly defined in existing literature, we conceptualise these as a combination of family idiosyncratic resources and marketing resources. The second study responds to the call issued by De Massis et al. (2014) and Chua et al. (2018) to search for ways to improve family owners' willingness to pursue innovation activities.

1.4 RESEARCH METHOD, IMPORTANT FINDINGS AND THE MAIN RESEARCH CONTRIBUTIONS

We employed quantitative research method with a cross-sectional research design and collected 412 completed surveys from family manufacturing SMEs in Chongqing, China. Chongqing contains 4242 private manufacturers (80% of which are family firms) and demonstrates significant R&D spending consisting of 23 billion yuan (around 2.6 billion GBP) by firms which have 20 million yuan revenue annually (National Bureau of Statistics of China, 2017). In addition, the number of private manufacturing firms and R&D ratio is larger than the private manufacturers of the cities in east and southwest areas in China, with around 5.4

million yuan spending per each firm in Chongqing. Moreover, it demonstrated a 10% annual growth of the number of new private manufacturing SMEs between 2012 and 2015 (Chongqing Annual Report, 2015). Chongqing provides a context for robust investigation towards family firms innovation.

We tested the hypotheses for two studies by relying on the 412 complete surveys and found: (1) fear of losing family control and influence is negatively related to firm innovativeness, (2) fear of losing renewal of family bonds is positively related to firm innovativeness, (3) both family patient capital and family social capital are positively related to family owners' willingness to pursue radical innovation, and (4) family human capital is negatively related to family owners' willingness to pursue radical innovation. Overall, this present study makes three contributions. First, the study finds that firm innovativeness is associated with the degree of family owners' fearful emotion placed on particular SEW dimensions. We highlight that family owners could *reduce* or *enhance* firms' innovation ability and capacity when family owners have a strong *fear of loss emotion* on maintaining *family control and influence* or on maintaining the *renewal of family bonds*. We create a new insight on how specific SEW dimensions can impact on firm innovativeness when SEW is in 'preservation mode'. Second, the present study found family firm resources have significant influence on family owners' willingness to pursue radical innovation; and highlights that family idiosyncratic resources play a key role in influencing the family owners' willingness. This finding brought completeness to the existing arguments on the ways to increase family owners' willingness to pursue radical innovation discussed in De Massis et al.'s (2014) study. Our study enriched the understanding on why family firms have a different degree of intentions to adopt radical innovation by bringing in quantitative empirical evidence; at the same time, it created a new viewpoint to reconcile the relationship between SEW and family firm radical innovation activities.

1.5 THESIS STRUCTURE AND CHAPTER OUTLINE

Chapter 2 is a literature review. A growing body of research is concerned with radical innovation activities among family firms. During the last decade, the study of family firms and radical innovation has diffused into various research streams driven primarily by aspects of governance. The aim of this literature review is to reconcile our understanding of the state-of-the-art research findings of radical innovation and family firms by employing a structured literature review technique. After analyzing 39 articles from a cluster of top-ranked journals (published between 2003 and 2016), we see that investigation of radical innovation and family firms are mainly located under the theoretical lenses of: (1) resources, (2) agency theory, (3) behavioural agency theory and socioemotional wealth, and (4) drivers of the

ability and willingness to innovate. By viewing radical innovation through these four lenses, we observe that radical innovation activities could be influenced by the level of family involvement in ownership and management, the family capability bundle (resources, knowledge, and experience), and family-oriented goals. These matters are potentially inter-related as well because differences in ways family firms acquire resources, their susceptibility to various institutional factors, levels of ownership and control, and the presence of different family-oriented goals can alter the intentions, motivations, and ability to engage in radical innovation. We present vital directions for future research, highlighting what key problems and gaps need urgent attention to advance our understanding of radical innovation in family firms.

Chapter 3 is called theoretical and conceptual treatment of family firm radical innovation. At the beginning of this chapter, we select two research gaps which currently need urgent attention: (1) SEW dimensions and family firm radical innovation activities, and (2) firm resources and family owners' willingness to pursue radical innovation. Two corresponding research questions were created to fill the two research gaps: Does the family owners' fear of losing emotions on different SEW dimensions generate different impact on firm innovativeness? What resources can direct family owners' attention to pursuing radical innovation? We thereafter established two theoretical models aiming to solve the two research questions.

Chapter 4 discusses the philosophical standing of the thesis and the particular methodological strategies employed in the present study. The process of collecting is explained in detail regarding the target population, identifying the sample, contacting firms, sending and collecting completed surveys. To ease the impact from common method variance, we separated the survey with independent variable constructs and the survey with dependent variable constructs and then sent it to the private firms at two different points in time. Then, we filtered the family firms from the private firms and identified 412 family firm cases. We decided to bring the 412 cases into the data analysis.

Chapter 5 demonstrates the process of analysing the two theoretical models by relying on the 412 completed surveys. We initially conducted data screening and cleaning to ensure the condition of the data was suitable for the later testing in SEM. Important results were shown for both models. For the first model, we found the fear of losing family control and influence is negatively related to firm innovativeness, and fear of losing renewal of family bonds is positively associated with firm innovation. For the second model, we found that family idiosyncratic resources are more important than marketing resources to influence family owners' willingness to pursue radical innovation. The finding for the second study

demonstrates family patient capital and family social capital is positively related to family owners' willingness to pursue radical innovation; while, family human capital is negatively related to family owners' willingness to pursue radical innovation.

Chapter 6 discussed the findings for both studies. It is structured from theoretical expectation, discussing the hypothesis, comparing the findings with previous family firm innovation studies and demonstrating the meaning of the findings. In this chapter, we highlight the importance of the relationships which are significant, and at the same time, we also discuss the relationships which show insignificance effects.

Chapter 7 summarised the two studies of the thesis by discussing the contributions, managerial implication and the reflections on the research methods. We show the studies' limitations and suggestions for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

What is our current understanding of radical innovation among family firms? What theories have been used (and should be utilised) to predict and explain radical innovation activity in family firms? Between 2003 and 2016, there was a dramatic growth in research on family firm innovation, led by large numbers of qualitative and quantitative studies, which have formalised a series of different theoretical lenses to investigate the phenomenon. These theoretical lenses have mainly looked at radical innovation under family governance structures, family involvement in ownership and management, family resources and capabilities.

Incremental innovation focuses on product and line improvement based on the existing products or other established resources (Geiger & Finch, 2016; Ghosh et al., 2017). Incremental innovation is a continuous and consistent activity that firms utilise to adapt the changing customers' tastes and in turn better fit a business environment (Garcia & Calantone, 2002). In Garcia and Calantone's (2002) study, incremental innovation is also deemed as *continuous innovation*. Different from incremental or continuous innovation, which mainly pursues existing product improvement and line extensions (Chandy & Tellis, 1998), radical innovation is defined as firms (both family firms and non-family firms) shifting from the current position to a novel position, creating substantial different new products which largely depart from the current technological trajectory (Chandy & Tellis, 1998; Veryzer, 1998). Radical innovation also tends to develop new products or implements new technologies and provides first-hand experience within a market (Veryzer, 1998; Govindarajan & Praveen, 2006; De Massis et al., 2016). For instance, when first introduced to aeroplanes and televisions within the market, most consumers were unfamiliar with such new products (Veryzer, 1998; Tripsas & Gavetti, 2000). However, at that time, those new products created breakthrough impacts in the market by establishing new industries and leading many old-fashioned products to become obsolete. Therefore, radical innovation is valuable and also promising for maintaining the market position of firms. Still, radical innovation contains great uncertainties, especially when firms lack experience in engaging new ways of delivering products and services. The benefits that could be brought by radical innovation activities are, most likely, unpredictable. However, radical innovation is still worthwhile, especially in family firms, to search for insights into wealth creation and to enhance firms' continuity (Konig et al., 2013)

Unlike traditional firms, family firms have unique forms of governance (Carney, 2005; De Massis et al., 2014). Specifically, while traditional firms are distinguished by the separation of ownership and control, family firms are characterised by their unification (Carney &

Gedajlovic, 2002). Within family firms, the unification of ownership and control is defined as a generic governance form that generates tendencies towards parsimony, personalism, or particularism that shape their strategic decision-making and investment behaviours (Carney, 2005). Under such a governance form, the incentive alignment between owner and manager is high, which reduces opportunism and lowers the agency cost associated with monitoring (Shleifer & Vishny, 1997; Carney, 2005). However, unified ownership and control can contribute little in terms of investment in innovative venturing because of the increased concern directed towards wealth preservation (Chandler, 1991; Matzler et al., 2015). This increased concern tends to trigger specific actions by the family firm regarding focusing on the status quo, entrenching the management team by linking the benefits of the family firm to the benefits of family members (Thaler & Shefrin,1981; Chandler, 1991; Singh & Gaur, 2013), maintaining family ownership and control (or its socioemotional wealth)(Gomez-Mejia et al., 2007) especially during succession periods (Morck et al., 1988; Anderson & Reeb, 2003; Kraiczy et al., 2014), and making nepotistic appointments to further solidify family influence (Carney, 2005).

In excess, the tendency of the family firm towards wealth preservation will mitigate its willingness to seek out and undertake radical innovation activity and make a less associated investment in R&D and specialised personnel (De Massis et al., 2014). For instance, family firms would be expected to allocate fewer resources (e.g. money, skilled employees, and technology) towards risk-bearing innovation activity because of the dilution or endangerment of family wealth. Such conservative, control-oriented behaviour typified in this scenario may reduce the organisational incentive to learn and filter out new knowledge and ideas that might be important for radical innovation. Without a sufficient motivation to innovate, and lack of sufficient supporting resources to do so, organisations can fail to build up their internal ability (or capability) for radical innovation (Chandy et al., 2003; De Massis et al., 2014).

This brings us back to the matter of governance. The tendency for wealth preservation and conservative resource allocation can depend on the governance structures at play in the family organisation (Durand & Vargas, 2003; Chrisman et al., 2013). Carney (2005) theorised that there are relationships among ownership and control and the decision-making process that can influence the formation of organisational capabilities that might be critical for innovation. For instance, increasing ownership among family members can generate stronger rights for the family over asset control, which, in turn, will exert stronger family influence on decision-making towards the family's interests and mitigate decision alignment with other investors' interests. As family involvement increases, radical innovation is less likely because of the speed of opportunity recognition, aggressive responsiveness, and

flexibility for adaption and adoption are diminished (Konig et al., 2013). However, a change in the composition of family ownership might diversify innovation strategies. To align others' interests in decision-making, family control over the firm's voting stock may need to be diluted by including more non-family shareholders, investors, and other trustees. It is a part of a conscious strategy to change the system of constraints surrounding the family firm's strategic activity (Patel & Chrisman, 2014). Although the involvement of non-family members will reduce family ownership, family firms can still generate effective control by appointing a professional CEO for certain decisions (Carney, 2005). Hence, the governance structures at play can influence the development of internal operational routines, processes, and systems (Lazonick & O'Sullivan, 2002) and further impact on the formation of organisational capabilities for radical innovation.

However, reducing the family members' degree of ownership and assigning some control and power to non-family board members and professional managers typically go against the family-centred goals of preserving family ownership and control (Gomez-Mejia et al., 2007; De Massis et al., 2014; Chrisman et al., 2015). Hence, conducting radical innovation by simply reducing family members' ownership and control and increasing power of non-family professionals is not appropriate.

However, innovation, especially radical innovation, still 'happens' in family firms which have high family involvement in ownership and control. Regarding radical innovation, evidence exists to suggest that family firms have better stamina, faster speed of implementation (Konig et al., 2013), and even better performance in innovation than non-family firms (Anderson & Reeb, 2003). The question then becomes one of *how* and *why* family firms appear to be this successful at radical innovation against a rather bleak backdrop. If the risk of the proposed radical innovation activity could be made acceptable and have the little negative impact on the pursuit of family-centred goals, radical innovation activity may be considered favourable by the family firm (De Massis et al., 2016; Li et al., 2016; Chua et al., 2018). Considering the features of organisational ability and willingness to innovate, the presence and effects of radical innovation activity could be different under various family governance structures, degree of resource stocks and innovation capabilities, and benefit the family firm and the behavioural context of the firm defined by its focus on socioemotional wealth (SEW).

This discussion points to four recurring theoretical debates in the family firm literature, all largely connected under the umbrella of the governance perspective. The first is the matter of governance structures and forms of governance put in place in the family firm, including family control over the board and management (Carney, 2005). Allied to that is matters of

the agency and behavioural agency within those governance structures in terms of the relative emphasis placed on SEW and the manner in which family owners, managers, and employees behave while subject to those governance structures. These matters feed into the third area, which is the ability and willingness of the family firm to innovate. Governance structures and the behavioural tendencies of family owners and managers first set the context for whether the firm is willing to innovate in more or less radical ways and what resources may be available to it (Carney, 2005; De Massis et al., 2014). Finally, and as a direct extension of this, because the family firm has a tendency to protect its interests and therefore prevent resource allocation towards projects with higher risk, the firm may then have fewer capabilities in terms of resources and knowledge to innovate radically even when the family owners' willingness is there (De Massis et al., 2014).[1]

To date, many studies of family firm radical innovation are theoretical investigations (Cassia et al., 2011; De Massis et al., 2015; Chrisman et al., 2015; De Massis et al., 2016). Greater quantitative evidencing of radical innovation in family firms is necessary to support (and generalise) theoretical expectations and ascertain whether these expectations carry predictive validity – and where they do not, to then refine those expectations and predictions. However, before proceeding to study the problem of radical innovation in future studies of family firms, it is necessary to pause and reconcile what we currently understand about family firms and radical innovation through a structured literature review to clearly present what important theoretical aspects must underpin these future studies. Hence, this paper will: (1) present the state-of-the-art of knowledge about family firms and radical innovation (ascertaining theory, absences and gaps), and (2) evaluate what are the most crucial problems that researchers need to address in their future investigations. Doing so will reconcile the rapid development in theory seen to date and highlight where our understanding is at its thinnest and in need of the most urgent attention, both theoretically and empirically.

Our model builds on 39 articles in total specifically pertaining to family firm *radical* innovation: 17 articles speaking *directly* to radical innovation in family firms and 22 articles which discussed family governance and family decision-making behaviour *towards* radical innovation (dubbed supportive articles) published between 2003 and 2016 in *Entrepreneurship Theory and Practice*, *Academy of Management Journal*, *Administrative Science Quarterly*, *Journal of Family Business Strategy*, *Journal of Small Business Management*, *Journal of Product Innovation Management*, and *Family Business Review*.

[1] To a certain extent, this implies a path dependency. Nevertheless, it is also possible that the absence of such capabilities is a conscious decision and a consequence of deliberate strategy-making emphasising a more conservative form of innovating.

Examples of radical innovation include works by Zahra (2005), Cassia et al. (2011), De Massis et al. (2012), Block (2012), Singh and Gaur (2013), Chrisman et al. (2015), and De Massis et al. (2016). While the example of supportive articles contains Sirmon and Hitt (2003), Gomez-Mejia et al. (2007), Chirico and Salvato (2014), and Carney (2005). Because there are many more articles in existence more widely in the field, the decision was made to select both radical innovation and supportive articles from top journals that have made important or seminal contributions and reveal the current understanding of radical innovation within family firms developed over the last decade.

This paper offers two contributions. First, it provides an in-depth overview and point of reference for the growing research effort into how family firms generate radical innovation. It helps crystallise why family firms have difficulties innovating in a radical manner and what the origin of those reasons are, our current state of knowledge on those reasons, and where high-priority research gaps exist in this debate. Second, it summarises the current academic investigation of radical innovation within family firms, locating and describing the research advances, problems yet to be solved, and promising areas in which to focus future research endeavour for the greatest contribution and impact.

This research begins by explaining the structured literature review methodology in detail, followed by the definition of the key terms and constructs of interest. Thereafter, the paper moves to discuss how radical innovation works within family firms by reviewing four theoretical lenses: (1) resource-based view (RBV), (2) agency theory, (3) behavioural agency theory and SEW, and (4) ability and willingness.

2.2 THE STRUCTURED LITERATURE REVIEW METHOD

This section explains and justifies the structured literature review method. It explains how journals and articles were searched and selected from various databases (e.g. EBSCO, ScienceDirect, Sage), and why the 39 papers were chosen for the main discussion of radical innovation within family firms. It will begin with a detailed explanation of the process for article searching, navigation and filtering, followed by a general explanation of the aims of these articles.

2.2.1 EXPLANATION AND JUSTIFICATION OF STRUCTURED LITERATURE REVIEW METHOD

A structured literature review is a method to make theoretical contributions by summarising the findings from a systematic selection of academic papers published by researchers and scholars (Kilduff, 2007). This approach seeks to demonstrate the ideas raised and research advances made in a period of time and use these ideas and advances as the evidence to

examine the research theme of interest. In doing so, this systematic method enables researchers to achieve a research aim centred on evaluating and critiquing the current or state of knowledge about the theme or phenomenon in question (Weed, 2005; Transfield et al., 2003). In terms of identifying and capturing the most appropriate scholarly papers for this analysis, it is important to create a focused and relevant article search process and locate articles within a certain time range as appropriate to the current research aim (Klassen et al., 1998). In doing so, the overall review should bridge various findings in a causal manner (Hart, 1998). For instance, the selected articles should help to explain conditions surrounding radical innovation activities, and how the effects of these conditions might vary across different family firm contexts. Hence, according to Transfield et al. (2003), a structured literature review can detect and connect possible related areas and fill research gaps by showing and bridging the similarities in between. It is also an approach to exhibit what important topics are present among wide and diffused research findings during a period (Kesner & Sebora, 1994). The structured literature review process is intended to be transparent, replicable and rational in that respect (Lightfoot, Baines & Smart, 2013; Parris & Peachey, 2013).

Mertens (2005) suggested that a structured literature review process and article filtering can be performed through the following steps: (1) read articles and define the key terms; (2) type the 'keywords' into the databases to search and select the articles which are important for the current research theme; (3) determine the connections among the key terms and discover the similarities and conflicts among them; (4) draw a literature map to link the terms that are relevant to each other; and (5) keep updating the literature map and list of articles, and elaborate the overall review. The following subsections will introduce the search methods and present the final article sample for data analysis.

2.2.2 LITERATURE SEARCHING

The databases identified for this study are ScienceDirect, EBSCO, Springer Link, Wiley, and Sage. Both radical innovation and supportive article searching criteria applied to these databases were limited to 'English version', 'peer-review', and 'full text' articles. In order to generate a list of articles relevant to the current topic, a priority searching process was carried out to cover all the keywords and their synonyms referring to radical innovation within family firms.

Based on the definition, radical innovations can possess disruptive properties (Garcia & Calantone, 2002; Slater et al., 2014) but not all disruptive innovations are strictly radical (Smith, 2005; Yu & Hang, 2010). At the same time, Garcia and Calantone (2002)

characterize radical innovation as bearing discontinuous properties, including both market and technology discontinuities. They acknowledge discontinuous innovation as a form of innovation, but in its definition expressly stated that discontinuous innovation, "may be either a radical innovation or really new innovation dependent upon at which level (macro/micro) and which S-curve(s) (marketing/technology/both) is affected by the introduction of the invention to the marketplace" (p.123, emphasis added). Therefore, to ensure that we did not omit relevant studies, we retained "disruptive" and "discontinuous" as additional search terms. Thereafter, each paper was screened for its fit to radical innovation.

Therefore, 'radical innovation', 'disruptive innovation', 'disruptive technological innovation', 'radical innovation', 'radical innovativeness' and 'discontinuous technological innovation' are all similar terms using as the key words to search articles. At the same time, wide keyword searching is also a way to prevent important journal articles and scholarly papers being lost, overlooked or omitted. For example, while searching 'family firms', 'governance', and 'radical innovation', supportive articles such as Carney (2005) will not be revealed among the search results. While inputting 'family governance' and 'competitive advantage' into the search, the seminal paper by Carney (2005) reveals itself in the EBSCO database. Through the initial reading of the articles of Cheng and Van de Ven (1996), Konig et al. (2013), Chrisman and Patel (2012), Chrisman et al. (2015) and De Massis et al. (2016), a list of search terms and vocabulary was created, including 'innovation', 'radical innovation', 'technological innovation', 'family governance structures', 'research and development (R&D)', 'radical innovation', 'exploration', 'motivation and ability', 'new product development', 'family influence and firm performance', and 'ownership and control'.

The search engines within the databases mostly use Boolean operators to examine their literature portfolio and ultimately report its results according to the presence of keywords (Hart, 2004). The results include journal articles, essays, magazines, books and newspapers if there are no searching criteria to constrain the auto selection. Therefore, the primary searching criteria were set to limit the results towards English version peer-reviewed articles. The publication timeframe of the chosen articles was restricted to between 2000 and 2016 in order to show recent advances and ascertain the important assumptions for the future investigation of radical innovation and family firms.

2.2.2.1 LITERATURE FILTERING

The filtering criteria restricted the searching results towards: (1) seminal academic contributions that have significantly developed the topic, and (2) highly relevant articles in line with the current research theme or providing support for radical innovation (e.g. arguing

about the radical innovation-decision process; connecting family governance and radical innovation). These two criteria were achieved in two ways. First, by reviewing the title of the article, the research concept from the abstract, the contents, introduction and conclusion, the key author or authors, the key argument(s), unstated assumptions, research background, and key examples, the articles deemed to be most relevant were identified. Also, selecting seminal works not only narrows down the thousands of search results, but also these works can present the key academic findings and evidence, new ideas, and in-depth understanding of the topic (Hart, 2004). Second, to support this endeavour, further selection was achieved by focusing the choice of journals as the publication outlets to 3- and 4-rated journal 'quality' as indicated by the Association of Business Schools (ABS) in the UK. While carrying a degree of subjectivity and imprecision likely attributable to any such ranking of journal quality, this measure helps provide an additional mechanism to reduce down the plethora of initial search results into a more manageable quantity based on a generally accepted list of journals defined as being of the international or world-leading standard. The journal articles chosen for the main analysis after referring to the ABS Journal Ranking Guide (2015) were sourced from *Entrepreneurship Theory and Practice*, *Academy of Management Journal*, *Administrative Science Quarterly*, *Journal of Family Business Strategy*, *Family Business Review*, *Journal of Business Research*, and *Journal of Small Business Management.*

2.2.2.2 FURTHER LITERATURE SEARCH

A further literature search was performed by trawling through the reference lists of these chosen articles. After reading the cited findings of former researchers within a paper, this process can identify what findings are relevant to the study of radical innovation in family firms. Tracing back to the publication and their authors then yielded further original papers whose findings and contributions were relevant to our study. These were then added to the literature dataset of our study. For instance, Carney (2005) cited Anderson and Reeb's (2003) paper to discuss the relationship between founding family ownership and firm performance. Their work identified that increasing family ownership holdings would result in better firm performance, a finding useful to bridge the discussion between family firms and radical innovation. Also, by checking the key authors' new publications, several articles were added to the final literature list. For instance, the work of Sirmon and Hitt (2003) was added after reading Chrisman et al. (2005).

In addition, searching several databases can yield similar results in some instances when inputting the same search keywords (e.g., when two databases provide access to the same journal) (Ridley, 2012). By comparing the results from each database and conducting a

double-screening and double-checking process to delete duplicates, the final article list was then created.

2.2.3 SAMPLE

While initially searching radical innovation and family firms, 70 papers were retrieved from the databases, meeting the criteria of English full-text peer-reviewed articles in line with the topic. After a round of screening, 31 papers that were not concentrated specifically on radical innovation and family firms were deleted. This screening was determined by examining the title and abstract of each paper. Ultimately, 39 papers published between 2003 and 2016 were selected for the final discussion with 17 articles purely discussing the radical innovation and 22 supportive articles with a section or sections addressing radical innovation and governance, resources, and behaviours (Table 2). Table 1 provides the names of the database, the journal, and a count of the articles drawn from them.

As shown in Table 2, the selected articles and scholarly papers about radical innovation and family firms were mainly located in four areas of discussion: RBV, agency theory, behavioural agency theory and SEW, ability and willingness, all of which were largely under the umbrella of governance. In Table 2, all the articles are listed together with details of their respective lenses. For instance, Chrisman et al. (2015), and Veider and Matzler (2015) discussed how conditions pertaining to the ability and willingness of family firms to act would influence their innovation activities. Accordingly, these two papers were grouped under 'ability, willingness, and innovation' theory. Since both papers have explained that family involvement in ownership and management will result in different goal selection and idiosyncratic family decision behaviour associated with innovation (Chrisman et al., 2015; Veider & Matzler, 2015), ability and willingness in this situation belong to the wider theme of governance.

Among the 39 studies, there are 21 quantitative and 18 qualitative studies examining radical innovation and family firms under the umbrella theme of governance. Since two studies used several theories at the same time (e.g., Le Breton-Miller et al., 2015, used three theories), and another six used two theories at the same time (Zahra, 2005; Chrisman et al., 2005; Kellermanns et al., 2012; Konig et al. 2013; Miller et al., 2015; Kammerlander & Ganter, 2015) to study family firm radical innovation, 17 instances of theory use were identified among the 39 studies.

TABLE 1: DATABASE AND JOURNAL ARTICLES FOR STRUCTURED LITERATURE REVIEW

Database, journals and number of articles from the specific journals		
Database	Journal	Count
Science Direct	Journal of Business Research	3
ScienceDirect	Journal of Product Innovation Management	1
ScienceDirect	Journal of Family Business Strategy	4
ScienceDirect	Journal of International Management	1
ScienceDirect	Journal of Business Venturing	1
Wiley	Academy of Management Review	1
Wiley	Journal of Small Business Management	1
Wiley	Journal of Product Innovation Management	5
Wiley	Entrepreneurship Theory and Practice	1
EBSCO	International Journal of Business, Management and Social Sciences	1
EBSCO	Journal Creativity and Innovation Management	1
EBSCO	Academy of Management Journal	1
EBSCO	Entrepreneurship Theory and Practice	8
Sage	Family Business Review	7
Springer Link	Small Business Economics	1
Loughborough University Research Depository	California Management Review	1
JSTOR	Small Business Economics	1
Total		39

TABLE 2: ARTICLE OVERVIEW

No.	Articles	Paper type	Theories	Sample	Data type	Finding	Arguments from the supported papers	Talking radical innovation
1	Chrisman et al. (2012)	Qualitative	Agency theory, ability and willingness	Structural literature review	Secondary data	Different agency types will generate different agency costs, which will influence future firm strategies in non-family management buy-in or buy-out.	Unified family governance structure constrains family firms' risk-taking behaviour and willingness to innovate	Supportive
2	Chrisman et al. (2015)	Qualitative	Ability and willingness	Structural literature review	Secondary data	Although increasing family involvement is positively associated with family owner-managers' discretion to allocate resources to innovate, family involvement is not necessarily related to the willingness to pursue radical innovation.		Yes
3	Veider and Matzler (2015)	Qualitative	Ability and willingness	Structural literature review	Secondary data	Ability and willingness paradox is not a general rule in every family firm. Innovative behaviour depends on the goals of family firms.	Family firms' willingness to innovate is based upon how family firms face the challenges	Supportive
4	De Massis et al. (2014)	Qualitative	Ability and willingness	Structural literature review	Secondary data	Family-oriented behaviour is generated by combining ability and willingness together.	Innovation activities of family firms are influenced by ability and willingness	Supportive
5	Zahra et al. (2004)	Quantitative	RBV	536 manufacturing companies. U. S	Secondary data	1 Individual orientation family firms' culture is positively associated with entrepreneurship behaviour, but this relationship will be then negatively related in the later stage. 2 the diversification of employees' ability is positively related to entrepreneurship behaviour. 3 Decentralised control is positively associated with entrepreneurship behaviour.	1 Family firms are innovative at the beginning of organisational life-cycle. 2 Knowledge resources are crucial for family firms' innovation.	Supportive
6	Cassia et al. (2011)	Qualitative	RBV	A case study of Four family firms, Italy	Secondary data	High 'closure' attitudes of family firms are negatively related to the NPD process. NPD process needs the high motivation of family firms.		Yes
7	Chrisman et al. (2005)	Qualitative	RBV and Agency theory	Structural literature review	Secondary data	Family involvement will influence family firms' performance.	Family involvement can increase altruism and entrenchment, which will nullify the value of existing capabilities and slow down the development of new capabilities.	Supportive
8	De Massis et al. (2012)	Qualitative	Agency theory	Structural literature review	Secondary data	Demonstrating current knowledge in family involvement and R&D expenditure and future questioned the relationships among innovation input, output, and activities as the fundamental thinking of family firms and technologic innovation studies.		Yes
9	Singh and Gaur (2013)	Quantitative	Agency theory	4946 firms in Bombay Stock Exchange, India.	Secondary data	1 Family ownership has a positive relationship with R&D intensity in a new market. 2 R&D investment is positively associated with family ownership in a new market.		Yes
10	Zahra (2005)	Quantitative	Agency theory, entrepreneurship	497 responses from 209, U.S manufacturing firms	Primary data	1 Family ownership and involvement have a positive relationship with technological innovation 2 Long CEO tenure has a negative relationship with technological innovation		Yes

11	Chen and Hsu (2009)	Quantitative	Family ownership and R&D investment	124 responses from 76 firms, Taiwan	Secondary data	Family ownership is negatively associated with R&D expenditure		Supportive
12	Block (2012)	Qualitative	Agency theory	154 firms listed in the S&P 500, U.S.	Secondary data	Founder involvement has a positive relationship with innovative activities in a later stage in organisational life-cycle within family firms.		Yes
13	De Massis et al. (2016)	Qualitative	Governance structure (Ownership and management)	Structural literature review	Secondary data	Creating an agenda to demonstrate how family firms innovate through tradition.		Yes
14	Kellermanns et al. (2012)	Quantitative	Agency theory and stewardship theory	126 responses from 70 firms, U.S.	Primary data	1 Innovativeness in family firms is positively associated with family firm performance. 2 generational ownership dispersion is positively related to innovativeness.		Yes
15	Konig et al. (2013).	Qualitative	Family influence, 4C (command, continuity, community, and connections)	Structural literature review	Secondary data	Family firms have high speed and stamina of implementing radical innovation strategies when family firms have made the decision to pursue innovation strategies.		Yes
16	Chrisman et al. (2015)	Qualitative	4C (command, continuity, community, and connections)	Structural literature review	Secondary data	Ability and willingness paradox plagues family firms to innovate. However, how will family firms be surviving without conducting any innovation activities?		Yes
17	Le Breton-Miller et al. (2015)	Qualitative	Agency theory, Behavioural agency theory, RBV	Structural literature review	Secondary data	It has found out the positive and negative side of agency theory and behavioural agency theory, generating future propositions for the future	1 High levels of tenure are negatively related to firms' entrepreneurship behaviour 2 the number of family member board directors' presence is positively related to entrepreneurship behaviour 3 family involvement in management is positively related to entrepreneurship behaviour.	Supportive
18	Sciascia et al. (2015)	Quantitative	Behavioural agency theory and SEW	240 firms, Italy	Primary data	1 Family ownership is negatively related to R&D intensity 2 Less family wealth invested in family firms, the higher R&D intensity.	SEW endowment is negatively related to R&D intensity.	Supportive
19	Kraiczy et al. (2014)	Quantitative	Upper echelon theory	63 firms with 127 TMT members, Germany	Primary data	1 new product development is positively related to multiple generations involving in TMT. 2 new product portfolio performance and experience are negatively associated with the ratio of family members involving in TMT.		Yes
20	Patel and Fiet (2011)	Qualitative	RBV	Structural literature review	secondary data	Family firms have advantages in enduring knowledge structures, shorter responding opportunities, combining diversified sets and creating economies of scope	When family survivability is threatened, firms will search for alternatives.	Supportive
21	Ingram et al. (2014)	Qualitative	Paradox theory	178 executive responses from 125 firms	Primary data	CEO with paradoxical thinking can increase innovative behaviour	Family employees'' knowledge and ability matter for pursuing innovation activities.	Supportive
22	Sirmon and Hitt (2003)	Qualitative	RBV	Structural literature review	Secondary data	Family firms have five idiosyncratic resources which bring competitive advantages. They are family human capital, family social capital, family patient capital, survivability capital, governance structure & costs.	Compared to non-family firms, family firms have advantages in pursuing innovation activities by relying on these resources.	Supportive

23	Chirico and Salvato (2014)	Quantitative	RBV (Knowledge internalization) and product development (PD)	592 firms, Switzerland.	Primary data	1 Dense social capital will can innovation inability within family firms because family members will strongly rely on social capital. 2 social capital enhances the product development outcome.	Social capital has an invert U-shaped relationship with the pursuit of conducting PD processing.	Supportive
24	Matzler et al. (2015)	Quantitative	Agency theory	829 firms, Europe	Secondary data	1 There is a negative relationship between family ownership and R&D intensity. 2 Family involvement is positively related to innovation outcomes.		Yes
25	Carney (2005)	Qualitative	Agency Theory, RBV	Structural literature review	Secondary data	There are three types of family firm governance, parsimonious, particularism and personalism.	Innovation activities are more likely conducted in the combination of particularism and personalism governance type.	Supportive
26	Sharma and Salvato (2011)	Qualitative	Ambidexterity	Structural literature review	Secondary data	Incremental innovation is largely helpful when family firms are at the grown-up stage. Radical innovation is needed when the market is highly saturated.	In order to achieve the highest firm performance, family firms need to combine incremental and radical innovation together.	Supportive
27	Covin et al. (2016).	Quantitative	RBV (resource bundle)	1749 responses, Germany, Austria, Switzerland, Liechtenstein.	Primary data	The combination of customer responses, social network and innovation motivation is positively related to radical innovativeness in family firms. Adding financial resources will maximise this relationship.		Yes
28	Lichtenthaler and Muethel (2012)	Quantitative	Dynamic capabilities	165 medium-sized firms, Germany.	Primary data	Family involvement is positively related to the sensing capacity of innovation.		Yes
29	Cucculelli et al. (2016)	Quantitative	RBV, Governance structure	3200 companies, Italy.	Secondary data	1 Radical innovation activities are highly dependent on the founders' risk-taking behaviour. 2 Poor firm performance is positively related to risk-taking behaviour; good firm performance has a negative relationship with risk-taking.		Yes
30	Craig and Moores (2006)	Quantitative	Four-stage life-cycle	67 companies longitudinal studies, Australia.	Primary data	The relationship between techno-economic uncertainty and innovation is weaker at a later stage than that in the early stage of organisational life-cycle.	Innovation activities are conducted more in established firms than those within young firms.	Supportive
31	Kammerlander and Ganter (2015)	Quantitative	SEW, Attention-based view	A case study of 8 firms, Germany	Primary data	1 Economic and non-economic goals are mutually reinforcing when family firms are experiencing intensity development. 2 different non-economic goals lead different firm radical innovation behaviours		Yes
32	Gomez-Mejia et al. (2007)	Quantitative	Behavioural Agent theory, SEW	1237 firms, Spain.	Primary data	Family firms will largely avoid risk-taking for the sake of preserving SEW endowment. However, family firms can be highly innovative when SEW endowment witnessed a significant loss.	The behaviour of preserving SEW will gradually block innovation activities during development.	Supportive
33	Chrisman and Patel (2012)	Quantitative	Behavioural Agency theory, SEW	964 firms, U.S	Secondary data	1 When results are below the aspirations, family firms will shift to lose mode and then increase the R&D expenditure. 2 Increasing in investment-time horizon can ease the risk-averse behaviour and increase the R&D expenditure.	SEW dimensions can direct family firms' attention towards either conservative or highly innovative.	Supportive
34	Berrone et al. (2012).	Quantitative	Behavioural Agency theory, SEW	43 family firms, and 43 non-family firms, U.S.	N/A	SEW consists of FIBER dimensions.	SEW can be shifted at any point in time and generate different innovative behaviour.	Supportive

35	Miller et al. (2015)	Qualitative	RBV, SEW	A case study of 4 firms, UK.	Primary data	SEW can generate two extreme behaviours which are rooted in family firms and influence the decision to pursue innovation. One is 'feeding parochial family desires' (FPFD), and the other is 'creating an evergreen organizations' (CAEO). CAEO directs family firms are making the innovative decision to pursuing firms' development; while FPFD type firms prefer to maintain the status quo by acting conservatively and voiding risk-taking.	SEW dimensions are the key factors to influence innovative goals creation.	Supportive
36	Kraiczy et al. (2014)	Quantitative	SEW	63 non-family firms and 114 small and medium family firms, Germany	Primary data	CEO's risk propensity is positively associated with new product portfolio innovativeness. This relationship is stronger in the early stage than in the later stage in organisational life-cycle.		Yes
37	Huang et al. (2015)	Quantitative	absorptive capacity	165 firms, Taiwan.	Primary data	1 R&D spending is positively related to innovation. the investment in R&D employees can increase the skills and knowledge held by employees and in turn increase organisational absorptive capacity. 2 absorptive capacity moderates the relationship between R&D expenditure and innovation.	Absorptive capacity can help facilitate innovation.	Supportive
38	Uhlaner et al. (2013)	Quantitative	Dynamic capability	229 firms, Netherlands.	Secondary data	1 Process innovation has more effects on sales growth than product innovation in SMEs. 2 external sources are positively related to sales growth 3 employee involvement in renewing activities is negative related to sales growth.	Resources are important for family firms pursuing innovation.	Supportive
39	Craig et al. (2014).	Quantitative	Entrepreneurial orientation	127 food industry firms, 246 media firms, 159 shipbuilding firms, Finland	Primary data	Risk-taking does not impact on innovation output.	There is no relationship between risk-taking behaviour and innovation outputs.	Supportive

2.3 DATA ANALYSIS: A STRUCTURED LITERATURE REVIEW OF RADICAL INNOVATION AND THE FAMILY FIRM

This section will begin with a general overview of the 39 family firm radical innovation studies in terms of how studies have engaged theoretical lenses in explaining radical innovation within family firms between 2003 and 2016. After the overview, it will then provide the definition of radical innovation followed by an assessment of the findings relating to radical innovation and the family firm. The overall data analysis attempts to bridge the findings of these papers and: (1) demonstrate the state of current understanding, and (2) discover the important directions in which to focus future research endeavours within each theme pertaining to radical innovation within family firms.

2.3.1 A GENERAL OVERVIEW OF THE 39 RADICAL INNOVATION STUDIES

FIGURE 1: FAMILY BUSINESS AND RADICAL INNOVATION STUDIES BETWEEN 2003 AND 2016

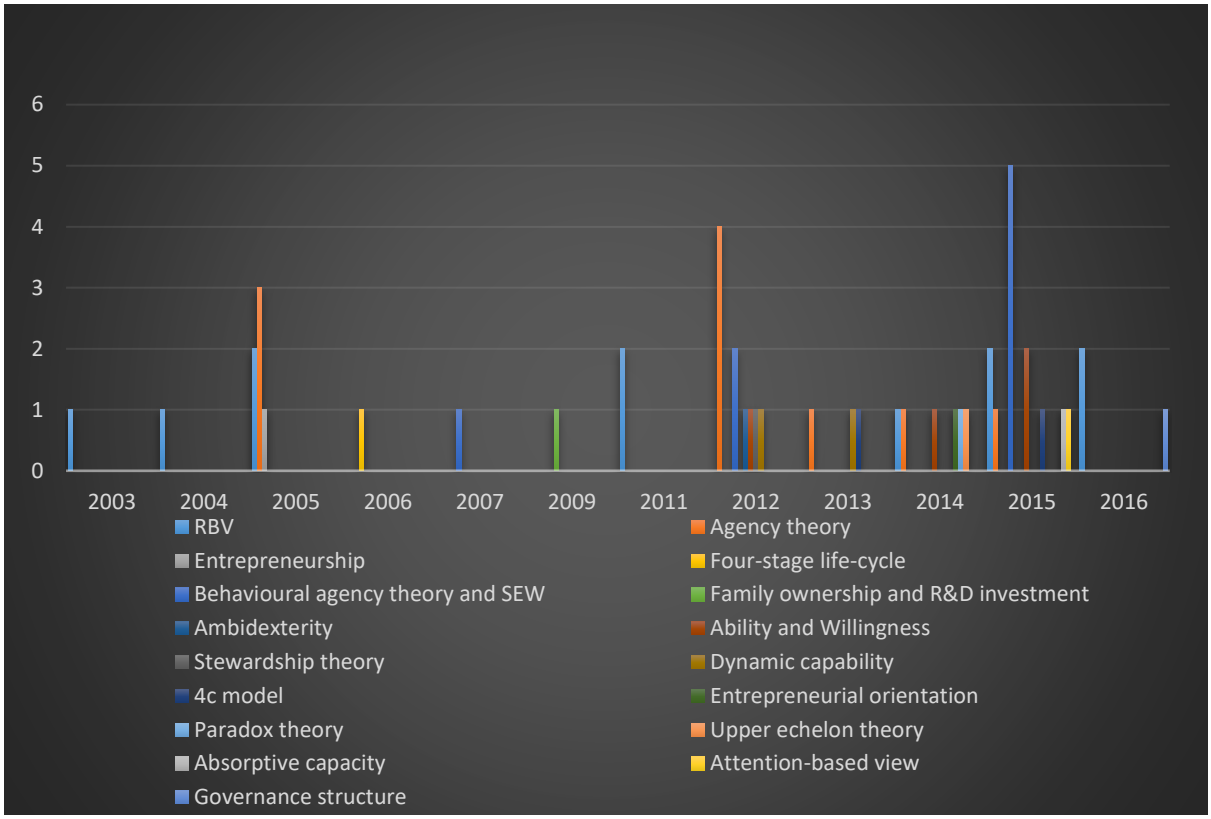
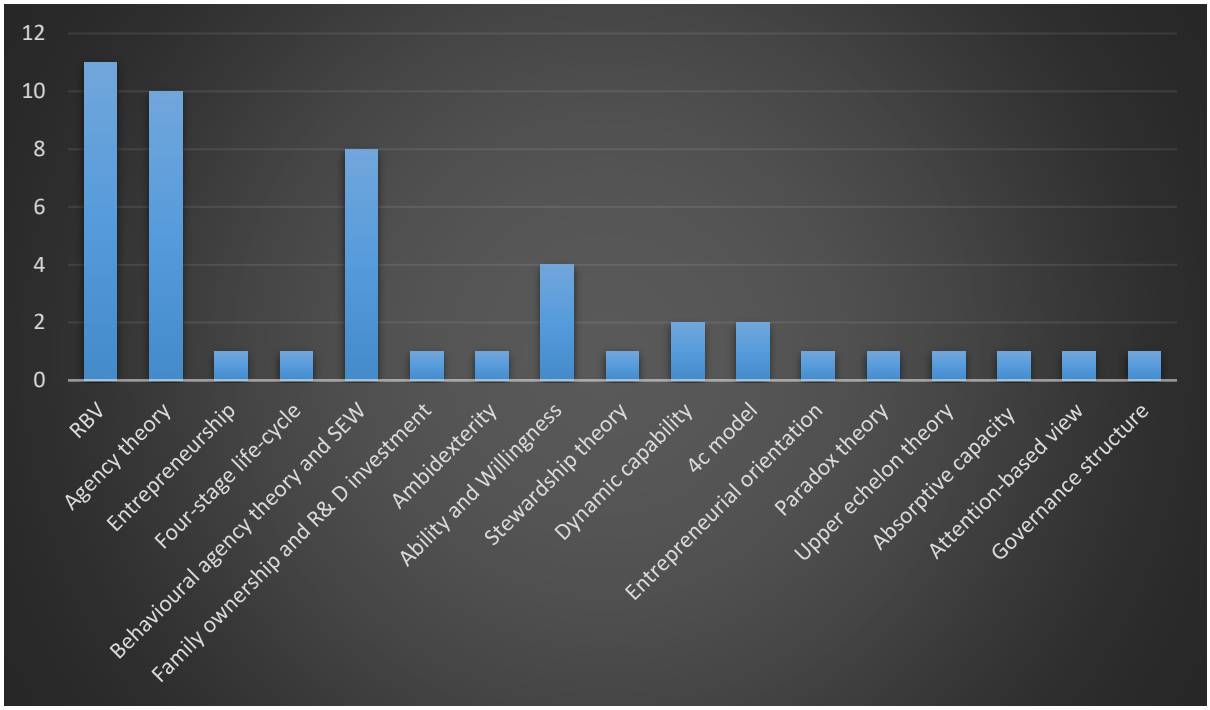


FIGURE 2: THE FREQUENCY OF THEORIES SHOWING WITHIN 39 STUDIES



Theoretical lenses used to analyse radical innovation within family firms expanded greatly over the last decade (Figure 1). Between 2003 and 2005, RBV and agency theory were the two main theories to study innovative value creation and business venturing among family firms (Chrisman et al., 2002; Shulze et al., 2003; Zahra et al., 2004; Sirmon & Hitt, 2003; Carney, 2005; Chrisman et al., 2005). The RBV highlights that the combination of resources and 'capitals' (i.e. human capital, social capital, patient financial capital, survivability capital, and governance structure and costs) (Sirmon & Hitt, 2003), family organizational culture (Zahra et al., 2004), and tacit knowledge (i.e. experience and actions) (Cabrera-Suarez et al., 2001) can leverage family firms' capability and entrepreneurial behaviour when taking risks, and in turn help the family firm stay competitive (Chrisman et al., 2005). Agency theory, on the other hand, explains that the increasing involvement of family members in ownership and management can cause stronger altruistic behaviour and a subsequent management entrenchment problem to occur (Chrisman et al., 2005; Carney, 2005). Increasing the involvement of family members can increase the financial burden (altruism) to the family firm, and the strong power of family members over others can constrain non-family talents from acting on behalf of the firm (entrenchment). It can, therefore, engender an inability among family firms, especially family SMEs, to undertake risk taking and in turn generate stronger conservative decision behaviour over time (Morck & Yenug, 2003).

Different from non-family firms, who are assumed to pursue mainly economic goals, family firms set both economic and non-economic goals during firm development (Chua et al., 1999). Through the investigation of behavioural agency theory and risk-taking among Spanish family firms, Gomez-Mejia et al. (2007) suggested non-economic goals, including family control and influence, identification of family members with the firm, binding social ties, emotional attachment of family members, and the renewal of family bonds to the firm through dynamic succession (termed FIBER), are primary concerns for family firms. Using this socioemotional wealth (SEW) as a reference concept, family firms can be either 'risk willing' along this dimension while seeking to increase firm performance so long as SEW is maintained and not jeopardised, or 'risk-adverse' when family firms are afraid of failing and compromising SEW, causing them to act conservatively towards investment. Thus, radical innovation may occur if it helps maintain or increase the family firm's SEW endowment. If such innovation jeopardises SEW, then the family firm will act conservatively, preferring a more stable form of innovation regardless of its relative financial contribution (implying that the effect of SEW is either context-specific or relies on other contingencies at play in the family firm).

Until 2012, investigation of radical innovation within family firms integrated RBV and SEW and then moved towards ability and willingness theory. To adopt radical innovation

successfully, family owners should meet two conditions at the same time. First, family owners should have the discretion to direct and allocate resources, which are needed for supporting a radical innovation project; second, the innovation project should match the goals, intention and motivation of family owners and then drive family firms to innovate (Chrisman et al., 2015). Radical innovation will fail if the family involvement is so low that family owners lack enough discretion to manage resources, or if family owners are highly committed to traditional trajectories that have little motivation to innovate (De Massis et al., 2016).

It is important to note that there is a positive linear relationship between family involvement in ownership and management and degree of ability (Matzler et al., 2015, but there is no consistent relationship between family involvement and willingness (De Massis et al., 2014). Generally, family firms have different focuses on pursuing economic and non-economic goals so that the willingness is highly contextual dependent (De Massis et al., 2014; Chrisman et al., 2015). In this case, radical innovation adoption should support the pursuit of both economic and non-economic goals. Once family firms have decided to adopt a radical innovation, the innovation is adopted in a more effective way than that within a non-family firm (Konig et al., 2013; Kammerlander & Ganter, 2015).

According to Figure 2, between 2003 and 2016, the dominant theoretical lenses are located in RBV (11), agency theory (10), behavioural agency theory and SEW (8), and ability and willingness (4) compared to the remainder. The following discussion will focus on these four theoretical perspectives in detail. These four theoretical lenses are not only the leading theories to explain family firms and radical innovation in terms of risk-taking behaviours regarding their goals and strategies, but also the foundations upon which the other theories are ultimately based. For instance, although there were other theoretical lenses used to explain radical innovation within family firms, such as absorptive capacity (Huang et al., 2015) and dynamic capability (Uhlaner et al., 2013), all were focused on dynamically reinforcing family firms' capability towards radical innovation. Therefore, the basic ideas behind the use of these theoretical lenses are based mainly on the RBV.

The following discussion will also bring other relevant theories into the four theoretical sections in order to establish a rich body of discussion. For instance, absorptive capability is defined as one of the organisational capabilities related to organisational learning and knowledge acquisition (Jensen et al., 2005). Thus, absorptive capability is suitable for the RBV section in supporting family firm knowledge acquisition.

The following sections will analyse in detail radical innovation within family firms under the four theoretical lenses by presenting the findings of the relevant articles, identifying

absences, and determining on-going gaps that are yet to be addressed. The beginning of the next section will discuss and compare the definitions of radical innovation and family firms from the studies, and identify whether the definitions are consistent among studies.

2.3.2 DEFINITIONS AND TREATMENT OF RADICAL INNOVATION AMONG EXISTING STUDIES

Radical innovation can create a radical shift from the firms' current status to a novel position; its ultimate intention is to introduce new technology combinations, new production lines, or new products (Anderson & Tushman, 1990). Such innovation is highly uncertain and dynamic, searching for novelty emerges by integrating state-of-the-art techniques with existing products and services, and combining the contexts of external business environment (e.g. institutional environments including policies, legitimacy, law, and taste of consumers) (Cheng & Van de Ven, 1996; Freeman & Soete, 1997; De Massis, 2016). Many family firm innovation studies believe radical innovation could assist firms to gain a sustained competitive advantage and help family firms take a big step forward in the current market (Konig et al., 2013; Uhlaner et al., 2013; Chrisman et al., 2015; De Massis et al., 2016). However, it is also difficult to specify radical innovation in a certain activity because radical innovation can have various forms that cover a broad range of innovative activities.

Family firm radical innovation can be mainly divided into product innovation and process innovation within these studies. From a product perspective, radical innovation can be recognised as a technological innovation, which is different from the former product-development trajectory (Hill & Rothaermel, 2003; De Massis et al., 2012; Konig et al., 2013; Kammerlander & Ganter., 2015). For instance, examples of radical technological innovation cited in other non-family firm innovation studies are minicomputers (Christensen & Bower, 1996), biopharmaceuticals (Kaplan et al., 2003), and digital photography (Tripsas & Gavetti, 2000). From a process perspective, for instance, radical innovation can be identified as a new product development process (NPD) (Cassia et al., 2011; De Massis et al., 2016). The purpose of NPD is to increase family firms' survivability by renewing the product process based on current economic and non-economic goals, social networks, values, and cultures of family firms (Kraiczy et al., 2014). Apart from the two specific radical innovation types above, some studies also investigate radical innovation activities as a whole within family firms (e.g. Patel & Fiet, 2011; Lichtenthaler & Muethel, 2012; Singh & Gaur, 2013). Since studies have investigated different radical innovation perspectives, the findings could not be consistently applied for all types of family firms. For instance, the studies of radical technological innovation within family firms cannot effectively apply to non-technological family firms.

Either product or radical process innovation can have levels of investment, and time spent in the implementation of innovation could be highly associated with the unique characteristics of family firms (Carney, 2005; Kammerlander & Ganter., 2015; Miller et al., 2015; De Massis et al., 2016). On the one hand, a certain rate of family firm sizes and resources can determine levels of firms' capabilities in conducting radical innovation (Habbershon & Williams, 1999; Matzler et al., 2015). On the other hand, intra-family conflicts (Block, 2010), family firm performance (Chrisman & Patel, 2012), and particular preferences and objectives of family members (Anderson & Reeb, 2003) can result in unique business plans, risk-aversion (Gomez-Mejia et al., 2007), and specific investment horizons (Thomsen & Pedersen, 2000; Chrisman & Patel, 2012), and thereafter result in varying levels of motivation towards innovation among various family firms (Anderson & Reeb, 2003; Gomez-Mejia et al., 2007). Since family firms are highly heterogeneous, in practice, it is hard to compare the findings with those studies and draw consistent conclusions in terms of circumstances and conditions for radical innovation and family firms (Kammerlander & Ganter, 2015).

2.3.3 THE RBV AND RADICAL INNOVATION

The RBV holds that the stock of valuable, rare, inimitable, and non-substitutable resources that a firm owns can provide it with a sustainable competitive advantage in its competitive market (Barney, 1991). Family firms' resources, such as strong internal and external social capital, internal financing activities, and highly unified ownership and control, can generate uniqueness in family firms' resource base and serve as a basis for competitive advantage (Sirmon & Hitt, 2003). In principle, these resources determine the strategic options available for the firm, aligned with the general principle in the RBV that each firm is a unique bundle of these VRIN resources and so capable to a greater or lesser degree to pursue different opportunities and courses of action (Barney, 1991). Family firms can rely on such uniqueness and further develop competitive advantage from it, one avenue for which may be a radical innovation.

Different from non-family firms, financial support within family firms comes mostly from family members (Sirmon & Hitt, 2003; Covin et al., 2016). Such limited financing activity results in limited financial resources that might constrain radical innovation activities which initially need abundant resources (Sirmon & Hitt, 2003; Chrisman et al., 2016). Also, the high altruism of family firms' behaviour is associated with strategic decisions which generate benefits (money and shares) and are in the interests of most family members (Miller & Le Breton-Miller, 2005). Although such altruistic behaviour can strengthen family bonds, and foster loyalty (Miller & Le Breton-Miller, 2005), it can also constrain innovation activities in

that distributing financial benefits could generate financial resource scarcity, especially in family SMEs (Block, 2012). In the case of lacking financial resources, firms will give greater concern to short-term growth strategy other than jumping out of the box and establishing long-time horizon return (Sharma & Salvato, 2011; Singh & Gaur, 2013).

Social capital includes internal social capital (relationship among employees within the firm), and external capital (between the firm and external entities) (Hoffman et al., 2006; Chirico & Salvato, 2014). Internally, since family members have shared values and goals, it can create highly cohesive daily operations within the firms regarding intensive and effective communication (Hoffman et al., 2006; Cassia et al., 2011). Such a communication style cannot only encourage mutual sharing of information, and facilitate flowing of information (Nahapiet & Ghoshal, 1998; Craig & Dibrell, 2006), but also enhance the feeling of trust among employees. Compared to non-family firms, employees can better handle the problems, and understand the mission and strategy of the firm more deeply (Kor, 2006). Hence, the family firm could quickly react to the opportunities with certain actions, and be confident in the risking-taking activities (Zahra, 2003). Externally, family firms can have the ability to search cooperation with stakeholders, develop long-term attachments with key stakeholders, and reinforce such partnerships and alliances with stakeholders through generations.

According to Carney (2005) and Dunn (1996), establishing contacts with stakeholders is not deemed as difficult because stakeholders are willing to connect to the family member who owns and manages a business, and has a certain social reputation. Also, the connected stakeholders prefer to invest in the innovation project that contains benefits from a long-term perspective (Chrisman & Patel, 2012; De Massis et al., 2015). By such support from external social networks, radical innovation activities could be adapted to a large extent (Covin et al., 2016).

However, the attention or emphasis attributed to risk-aversion in the family firm's decision-making will reduce when the family firm's financial resources are strong; specifically, an abundance of financial resources can increase the probability of adopting radical innovation within family firms (Covin et al., 2016). Considering the family firm size, larger firms can have more social, human and financial resources than SMEs (Danes et al., 2009), internally leveraging knowledge and abilities held by employees, and externally tending to have better chance to sense opportunities from a relatively strong social capital (Lichtenchaler & Muethel, 2012; Chirica & Salvato, 2014). These resources can increase family firms' likelihood of conducting innovation activities; and the negative impact from the radical innovation failure

could be eased if firms have ‘slack resources’ which are more than is actually needed (Gibbert et al., 2007).

Compared to the large family firms, adopting innovation in a radical manner within small family firms involves less freedom. In the beginning, radical innovation activities require a high degree of ‘sunk costs’ (once it has invested, then it could not be moved), injecting into the research and development (R&D) (Singh & Gaur, 2013). After new products had published, the knowledge generated by R&D might be copied or ‘invented around’ by rival firms (Harabi, 1995). In such a situation, the R&D investment could not receive the full return as initially expected (Block, 2012). If family SMEs consumed a lot of resources and energy on innovation activities, which contain a high degree of failure or long-term payoff, firms might meet resource scarcity and find it hard to maintain daily operation (Sorensen & Stuart, 2000; He & Wang, 2004; Singh & Gaur, 2013). Therefore, SMEs may drop into a fluctuated market position judged by the degree of success of the innovation activities (De Massis et al., 2014; Chrisman et al., 2015).

Still, radical innovation activities cannot fully depend on the size of the firm. Although the larger family firm normally has stronger social capital, in which it can have better chance to recognize the opportunities from social networks (Lichtenthaler & Muethel, 2012; Kraiczy et al., 2014;), strong social capital will constrain the radical innovation paradigm, because family members favour dense social capital and might rely heavily on it, instead of searching for enhancing the creativity of their own (Chirico & Salvato, 2014). In such cases, large family firms do not have an absolutely higher chance in adopting radical innovation than that within SMEs (Craig et al., 2014). In addition, family SMEs can react to opportunities faster than large firms, because large firms have a relatively high formalised bureaucratic system in which the decision-making should be made in a systematic way in order to meet the policy and legitimacy (Gudmundson et al., 2003; Craig & Moores, 2006; Patel & Fiet, 2011; Uhlaner et al., 2013). At the same time, an innovation activity, especially a radical version, forces some parts of the firm to experience intensive change, which might raise family members’ fear of losing job control latitudes (Craig & Moores, 2006; De Massis et al., 2016).

Considering the heterogeneity of different family firms, the adoption of radical innovation is associated with how many degrees of risks can trigger firms to conduct radical innovation (Singh & Gaur, 2013; Sciascia et al., 2015). Family firms like to engage in innovation activities which can generate reliable performance other than high-performance innovation activities (Patel & Chrisman, 2014). Covin et al. (2016) found innovation activities are highly related to the ‘resource bundle’, including a certain market demand from customers, financial resources which can support an overall innovation project, a strong social capital which firms

could rely on, and firms' knowledge which can help exploit the products and later gain competitive advantage. However, there is no causal relationship between each one of them within the resource bundle and radical innovation. That is, family firms should have developed their unique resource bundle as the basic condition for conducting radical innovation. Family firms having abundant resources could adopt radical innovation with fewer uncertainties than rival firms lacking in well-developed resources and resource bundles.

However, after we summarised studies through the lens of RBV (Table 2), the investigation of family firm firms is limited by bringing all possible resources held by a family firm and radical innovation activities together. It is beneficial to make a contribution to family heterogeneity and radical innovation in a resource perspective. Thus, an unresolved gap is what those resource stocks and bundles should consist of and whether specific resource histories and trajectories create lock-ins that may only further hinder family firms.

2.3.3.1 ACQUISITION OF KNOWLEDGE RESOURCES FOR RADICAL INNOVATION

Knowledge resources could not only be viewed as an important aspect in conducting radical innovation (Sirmon & Hitt, 2003; De Massis et al., 2012; Kotlar et al., 2013), but also help firms establish strong tacit knowledge in order to maintain the market position, and prevent competitors fully imitating them (Lichtenthaler & Muethel, 2012; Chirico & Salvato, 2014). A question lies in how family firms acquire and utilise knowledge resources for radical innovation.

Although firms can encourage organisational learning, innovation can still fail if firms are lacking in capability to utilise the learned knowledge (Chirical & Salvato, 2014; Huang et al., 2015). Absorptive capacity could be defined as such capability regarding acquiring knowledge from the external environment, assimilating the learned knowledge into the operation, and combining the knowledge along with current skills to foster the innovation capability (i.e. ability to innovate) (Cohen & Levinthal, 1990; Huang et al., 2015). Absorptive capacity can be improved by enhancing internal socialisation, which tends to unify employees' behaviour to confirm the organisational working style, and by creating strong business networks which can provide various external information and chances of cooperation (Jansen et al., 2003). Low absorptive capacity can affect the firm negatively and result in poor organisational learning, lead to low opportunities recognition and low chance of launching a radical innovation (Cohen & Levinthal, 1990), while high absorptive capacity has a positive impact on radical innovation outputs (Huang et al., 2015). If family firms can effectively receive and assimilate specific knowledge, financial and technical support in line

with the radical innovation from the external environment, family firms can have a higher chance to conduct radical innovation.

However, the process of increasing absorptive capacity could be different compared to non-family firms. The separation of the 'outsider' (non-family employee) and 'insider' (family member) mindset is deep rooted in many family firms (especially during the first and second generations) (Zahra, 2012). Normally, founders would favour the development of their children, take extra care with other family members, and eventually undermine the non-family employees (Chua et al., 1999; Zahra, 2005). In this case of unequal treatment, family firms can not retain non-family talent (especially those who hold contradicted opinions with owners) (Zahra, 2012), and, over time, firms would be lacking in diversification of professional knowledge support, generating 'strategic simplicity' (highly routinized operational processes) (Cohen & Levinthal, 1990; Miller, 1993; Carney, 2005; Zahra, 2005; Zahra, 2012). Although family firms are able to generate effective socialisation and shape the employees' ideas towards a common goal, the firms also narrow the innovation paradigm of employees and routinize the operation (Zahra, 2016; De Massis et al., 2015). Family firms increasingly prefer the status quo rather than pursuing radical innovation, learning from the experience, and utilizing 'ready-made' planning in dealing with problems in the ongoing renewal business environment (Sharma & Salvato, 2011; Gomez-mejia et al., 2007; Zahra, 2016). As the non-family employees' knowledge has been less effectively utilised, the knowledge resource for adopting innovation activities depends on the knowledge of founders and other family members (Miller, 1993; Block, 2012).

Family firms' founders, who act as the CEOs, have the power to integrate various resources around them and align such resources and their interests into strategic actions (Block, 2012). During the development of firms, founders are equipped with vast business experience both in business operation and innovative venturing (McConaughy et al., 1998; Cucculelli et al., 2016). Cucculelli et al. (2016) contended that the founders are more innovative than managers within a family organisation. However, the investment behaviour of the founders will not stay constant in the long-term. That is, radical innovation activities act in a decreasing manner (Miller, 1998; Zahra, 2005). In other words, firms are active in risk-taking at the business start-up stage and have less incentive to consider radical innovation in the mature stage (Zahra, 2005; Hannan & Freeman, 1984; Craig & Moores, 2006). The concern of founders will be much occupied with how to protect family legacy and reputation through generations, and preserve family wealth for the next generations (Schulze et al., 2001; Chrisman & Patel, 2012). Also, the low innovation incentive and conservation decision behaviour of family founders can influence employees to act with less motivation in adopting radical innovation (Kellerman et al., 2008; Zahra, 2005; Lumpkin et al., 2015). Indeed, family

firms have the ability to learn, but narrowed information searching can impede the inflow of knowledge (Patel & Fiet, 2011; De Massis et al., 2016). Over time, the ability to conduct innovation is reduced and eventually undermined (Zahra, 2005) and committed to the family tradition (De Massis et al., 2016). The decision-making mindset might be caged regarding protecting the family tradition and legacy for at least two generations in terms of first and second generation leaders acting conservatively in decision-making, and the third generation could manage more democratically in integrating ideas from both family members and non-family employees (Cruz & Nordqvist, 2012). Still, until the third generation, the only democratic decision behaviour cannot push firms to engage with radical innovation because long-term low innovative orientation has created a rigid mental model of employees, which constrains innovative thinking (Huang et al., 2015).

In this case, knowledge resources acquisition for adopting radical innovation could be achieved in three different ways: first, increasing founders' competence (Philips et al., 1984; Zahra, 2012; Lichtenthaler & Muethel, 2012; Cucculelli et al. 2016), second, sending second generation leaders to train in other firms within the same industry (Galunic & Rodan, 1998; Zahra, 2012), and third, conducting foreign technical assets acquisition (Singh & Gaur, 2013).

The purpose of providing learning for founder-CEOs is to broaden their mind to against narrowed information searching (Hannan & Freeman, 1984; Sorensen & Stuart, 2000; Bassant et al., 2010; Zahra, 2012), to increase founder-CEOs' sensitivity in seeking opportunities, and to lengthen founders' investment horizons (Miller, 1998; Kotlar et al., 2013; Lumpkin et al., 2015). Learning, in this case, is mainly practically oriented in providing risk projects for founders to try (Cucculelli et al., 2016). Through such learning, over time, family founder-CEOs could act less conservatively and may consider how to access wider resources, as well as how to utilise the resources effectively in innovation (Zahra, 2012; Cucculelli et al., 2016). It could result in a higher chance in adopting radical innovation.

To foster the ability of successors, family founders can provide on-the-job training (e.g. junior management interns) for next-generation leaders at their early age (learning from relatives and other non-family employees) (Carne & Ireland, 2013; Cruz & Nordqvist, 2012). Sending the next family organisation leader to train in other firms cannot only differentiate their business experience but also can strengthen the trust and reinforce contacts between firms (Carne & Ireland, 2013; Zahra, 2012). Also, it can develop family business affiliations and create chances to access financial resource towards radical innovation (Singh & Gaur, 2013). Kraiczy (2014) found that a large number of generations within a family can bring fresh insights from different aspects that stimulate the chance of adopting radical innovation.

However, as shown in the findings from Table 2, the contextual difference might influence difficulties in the implementation of the resource acquisition mentioned above. The learning process of founders and next-generation leaders can fail in adopting radical innovation if they have low individual absorptive capacity (Huang et al., 2015). That is, the process of receiving knowledge to utilising it in radical innovation could not be identified as effective. At the same time, knowledge accumulation is a slow and costly process in which firms should continuously invest time and money before witnessing radical innovation adoption (Patel & Fiet, 2011). Also, family firms cannot engage in radical innovation if the external environment is changing dramatically (Block, 2012). For instance, radical innovation cannot generate long-term benefits if the taste of the customers is changing quickly (Le Mens et al., 2015). There is little research in what kind and degree of knowledge founders, owner-managers or second-generation leaders should possess that can help family firms conduct radical innovation.

In addition, it is also hard for family firms to conduct foreign technology acquisition towards radical innovation. Although combining current skills of firms with foreign technologies can increase the chance of conducting radical innovation (Singh & Gaur, 2013), family firms could cost a great deal on the acquisition of foreign technologies that might go against the behaviour of pooling economic wealth (Carney, 2005). In addition, the joint venture could contribute more innovation activities (Czarnitzki & Krafit, 2009), but this would also result in losing ownership and control of family firms (Patel & Fiet, 2011).

2.3.3.2 RESEARCH GAPS OF THE STUDY OF RESOURCES AND RADICAL INNOVATION

In order to conduct radical innovation, the resources or resource bundles which family firms have or intangible resources which the firms accumulate and acquire should fit the requirements of radical innovation adoption. Considering the uniqueness of family firms' resources, they could establish resource stocks or bundles to create a basic condition for radical innovation adoption. Further radical innovation investigation within family firms can find the composition of the resource bundle.

> *Research gap 1: What resource bundles should family firms possess or develop to facilitate a high degree of radical innovation? Are there specific resource histories and trajectories that create, facilitate or hinder the family firm in terms of radical innovation activities? What role does tradition play in the resource endowment of family firms and do those traditions and associated resources help or hinder radical innovation? What firm resources can direct family owners' willingness to pursue radical innovation?*

Research gap 2: What kind and degree of knowledge should the family founder(s), owner-manager(s), or next-generation leader(s) possess, acquire or seek to build within the family firm to change the system of constraints in favour of radical innovation?

2.3.4 AGENCY THEORY AND RADICAL INNOVATION

A favourable agent, a manager or a management team can represent some owner/owners to make a strategic decision by following the owner's best interest and maximising the value (e.g. profits and market share) (Jensen & Meckling, 1976). In non-family firms, in order to reach such a perspective, owners can assess the potential of the strategic decision which was made by agent managers, and then provide relevant resources as support; at the same time, monitoring and confirming agent managers who do not make decisions by following their own best interests.

However, in non-family firms, agency problems can derive from the conflicts between the owner and agent managers in which agent managers increase their utility during a project, but, at the same time, create a negative impact on organisational value (Block. 2012). For instance, agent managers have incentives to pursue the most advantages for themselves when a firm has acquired benefits from a venturing investment, but they also lead shareholders to undertake the main losses when the investment of a project failed (Leland & Pyle, 1977). In such a case of manager and owner conflict, and agent moral problem, incur high costs on monitoring (e.g. issuing financial statements), or spend money on bonding managers with the firm (stimulating the managers' incentive) after utilizing constructed principles, which constrain the agent manager's decision latitude (Chen & Hsu, 2016).

The unification of management and control within the family organisation could create close alignment between agent manager and owner, and further reduce the agent cost related to conflicts between owner and lenders (Block, 2012; Le Breton-Miller et al., 2015). In contrast to non-family firms, the family owner normally has great power to control the firm and make a dominant decision, and the high family involvement in management can generate effective monitoring and minimise the agency cost (Chen & Hsu, 2016). Carney (2005) found the family involvement will generate three main governance propensities: parsimony, personalism, and particularism. Parsimony entails that family firms preserve resources and allocate them carefully. Firms, in this case, would reduce the risk-taking activities and pool the resources for current survival and future development. Personalism refers to the family firm that has concentrated management and ownership, generating great power for family members. Hence, strategic decision-making and problem solution could take priority over the

bureaucratic control within firms. Based on the premise of personalism, particularism entails strategic decisions may be influenced by non-economic family goals (Carney, 2005). For instance, family owner-managers should consider non-financial benefits (e.g. ownership) to others while making a strategic decision (altruism) (Chrisman et al., 2005; Chrisman et al., 2012).

In terms of firm survival, Carney (2005) found that the three governance propensities could bring distinctive ways of gaining competitive advantage. Parsimony propensity can help pool the resources (i.e. financial resources, and human resources), and outcompete other rivals in a scarce environment (Sirmon & Hitt, 2003); while the combination of personalism and particularism can accumulate social capital (e.g. kinship, ethnicity group, community and political affiliation) for long-term development (Granovetter, 1994; Miller & Le Breton-Miller, 2003), and can have the power to make quick decisions in reacting to the opportunities.

However, the propensity of parsimony, personalism, and particularism can also influence radical innovation in different ways. Under parsimony, family firms will primarily concentrate on wealth preservation and cost-saving instead of innovation venturing while dealing with the risk of market resource scarcity (De Massis et al., 2015; Sirmon & Hitt, 2003). Since radical innovation requires various resources, the generated huge sunk costs cannot persuade the owner to take the investment if the coming innovation activities also include great uncertainties (Singh & Gaur, 2013). In order to shift the owner's willingness towards innovation projects, agent managers, in such a case of parsimonious propensity, like to make investments in low-uncertain innovation activities which can increase sales in a short time with a short return period, instead of conducting projects which contain short-term losses but long time horizon for returns even it seems promising (Sharma & Salvato, 2011; Singh & Gaur, 2013).

Under personalism and particularism, although the high involvement of family members can give owner-managers great power, the decision-making should be highly limited to altruism behaviour in which only innovation activity which can benefit most of the family members (both current generation and next generations) will most likely be chosen (Lichtenthaler & Muethel, 2012; Berrone et al., 2012; De Massis et al., 2015). That is, selected innovation activities assist firms to lengthen the horizon for payoff and benefits for other family members (Chrisman & Patel, 2012; Singh & Gaur, 2013). Although family involvement can reduce agency cost on monitoring, strong altruism behaviour (e.g. nepotistic appointments) and management entrenchment can lead family free-riders (who have high dividends but are not engaging the business) and provide power for family members to pursue self-interests (Chrisman et al., 2005; Block, 2012), which might cause misuse of funds in radical

innovation projects, and eventually cause agency problems again (Chen & Hsu, 2016). Sometimes, high family involvement can render severe conflicts, which could generate an adverse impact on firm performance (Faccio et al., 2001).

2.3.4.1 RESEARCH GAP OF THE STUDY OF AGENCY THEORY AND RADICAL INNOVATION IN THE FAMILY FIRM

After we have viewed the arguments through the lens of agency theory in Table 2, the degree of risk-aversion is highly related to the different degree of family involvement in ownership and management, and styles of governance (Fernandez & Nieto, 2006; Chrisman et al., 2015). Within a high degree of family ownership and parsimonious propensity, firms are less likely to adopt radical innovation because high ownership could create tight organizational control by following the goal of wealth preservation, which can highly shape employees' idea and behaviour into a conservative trajectory and block innovative thinking over time (Chin et al., 2009; Cheng & Van de Ven, 1996; Munari et al., 2010). Under personalism and particularism and high family ownership context, although altruistic thinking limits the behaviour of family firms, opportunistic investment decisions are encouraged if the proposed investment could be in line with the interests of family members (e.g. long-term profitable, and survival) (Zahra, 2003; Anderson & Reeb, 2003; Zahra, 2005; Sirmon & Hitt, 2003; Miller & Le Breton-Miller, 2005; Chrisman & Patel, 2012; Kellermanns et al., 2012; Singh & Gaur, 2013; De Massis et al., 2014). Family firms are likely to engage with radical innovation which contains great long-term benefits in line with goals and strategies; and are less concerning on the drawbacks generated from radical innovation (e.g. putting the short-term wealth at risk (Chrisman & Patel, 2012). In this case, risk-aversion behaviour might be reduced when family firms focus on long-term potential. However, there are few studies classifying levels of family involvement in ownership and management would generate different levels of risk-taking behaviour within family firms under personalism and particularism. It can make a contribution to closely investigating the relationship between the goals of family firms and radical innovation activities.

Research gap 3: How might varying levels or intensity of family involvement in ownership and management result in different levels of risk-taking behaviour? Under what conditions does a family unit treat a radical innovation project as being in line with the interests of family members? What conditions vary the functioning of the family's tendencies towards personalism, particularism and parsimony in ways that encourage radical innovation as opposed to more conservative courses of action? Is there a particular point of family involvement when risk-taking behaviour either increases or declines?

2.3.5 BEHAVIOURAL AGENCY THEORY, SEW AND RADICAL INNOVATION

Behaviour agency theory entails that risk-bearing decision attitudes can be dependent on different contexts (Kahneman & Tversky, 1979). For instance, by combining resources, agency theory and radical innovation, family owners would pay great attention to avoid risk-taking, or at the very least calculating the risks of an innovation project in order to prevent the loss of wealth (Sciascia et al., 2015; Le Breton-Miller et al., 2015). This loss of wealth includes financial wealth and socioemotional wealth (SEW) (Gomez-Mejia et al., 2007). To this end, the decision-making of family firms is typically more loss-aversion than risk-aversion in terms of avoiding losses than with obtaining gains. For example, Gomez-Mejia et al. (2007) argued that when faced with a risk to financial and non-financial wealth (SEW), the family firm is willing to tolerate an economic loss (or hazard) to protect its SEW.

According to Gomez-Mejia et al. (2007), SEW endowment represents the non-financial wealth of the family and includes the preservation of family reputation and social identity, social capital, the degree of family influence (control), and the longevity of business through generations. On the one hand, family firms tend to protect family legacy and avoid pursuing the type of innovation which has strong tendencies to harm such a legacy (De Massis et al., 2016); on the other hand, family firms engage innovation for the sake of gaining long-term benefits without losing family control (Miller & Le Breton-Miller, 2005). Compared to financial wealth, family firms typically place stronger attention on and attach greater importance to SEW endowment. Doing so results in two decision behaviours with regard to risk-taking.

First, according to Berrone et al. (2010), family firms have a strong intention to preserve SEW endowment, even if such conservation intention will miss financial opportunities, which can further decrease sales growth. In this regard, family firms seldom conduct radical innovation because it might create changes and endanger the SEW endowment (e.g. social identity, ownership and control, and continuity of business) (Morck & Yeung, 2003; Berrone et al., 2012; Le Breton-Miller et al., 2015).

Second, the preference of family firms could attach to risk-taking (even if it will harm the firm's performance) may yet be high if sustained poor performance leads to a decrease in the family firm's SEW endowment (Gomez-Mejia et al., 2007; Berrone et al., 2012). As such, SEW becomes the core focus of decision making and subsequent strategic activity, and not economic gain per se. In order to rescue the SEW endowment losses caused by poor firm performance, family firms can act more innovatively than before. In this case, innovation activities would be considered to a large extent for the purpose of saving SEW. However, theoretically, it implicates that a risk-taking strategy will not be primarily pursued when the performance has not reached a point where SEW has witnessed a decreasing trend.

Although Chrisman and Patel (2012) argued that family firms could emphasise entrepreneurial behaviour, particularly when much concerned about passing the business on to next-generation family members, because renewal of the family business can provide career opportunities for the next generation family members (Chrisman & Patel, 2012; Miller & Le Breton-Miller, 2005). Considering that such a renewal process would be conducted under the premise of identity and reputation protection (Berrone et al., 2010), incremental innovation is more likely to be adopted as a renewal strategy than as radical innovation (Sharma & Salvato, 2011).

Chrisman and Patel (2012) and Le Breton-Miller et al. (2015) both argued that risk-taking and risk-averse behaviour within family firms should be dependent on the weighting placed on pursuing either a short-term or long-term goal. Short-term goals are specific, certain and practical and tend to deal with improving the current business (Carney, 2005; Sorensen & Stuart, 2000). When family firms put more emphasis on pursuing short-term goals rather than long-term goals, family members prefer to take short-term investment in order to maintain/enhance current SEW endowment and receive a quick return such as short-term sales growth (Chrisman & Patel, 2012; Miller et al., 2015). In this case, incremental innovation would be mainly considered (Sharma & Salvato, 2011; Kraiczy et al., 2014). On the other hand, in general, long-term goals are generated from the combination of the firm's current performance, capability, business environment and business aims of the future (Porter, 1980). Compared to short-term goals, long-term goals are fuzzy and uncertain, containing not only risks but the potential for the firm’s long-term development and survival. Since long-term goals are distant from the current business aim, if family members have the intention to pursue long-term goals instead of short-term goals, family firms need to act radically in strategic decision making and choose radical innovation as an option to assist family firms to achieve the goals. In such a case, family firms are willing to take short-term losses of both economic and non-economic wealth (SEW endowment), give less emphasis to altruistic behaviour, and hire non-family talent (Chrisman & Patel., 2012; Singh & Gaur, 2013; Sciascia et al., 2015), in contrast to what we might expect from a pure SEW perspective (e.g., Berrone et al., 2010; Gomez-Mejia et al., 2007).

By conducting an investigation into family manufacturing firms, Chrisman and Patel (2012) suggested that the investment horizon can be shifted from short-term to long-term within family firms. Family CEOs like to calculate the potential losses and gains of wealth before investing in R&D and like to assess the R&D performance frequently after the investment. For example, when the uncertainties of conducting innovation exceed family CEOs’ perception of acceptable risks, family CEOs hesitate to make a risky decision in responding to the innovation (Kammerlander & Ganter, 2015). Then the risky decision in such innovation

activities would be diminished. However, if the R&D performance has met the perception of family owners in terms of increasing economic performance and, at the same time, maintaining or enhancing the SEW endowment, family owners become more risk-willing, to adopt fuzzier and longer-term investment which contains more uncertainties (Chrisman et al., 2012; Li & Daspit., 2016). In this case, innovation activities start from incremental ones including a low degree of risks and uncertainties and move towards radical innovation (Kraiczy et al., 2014; Li et al., 2016). Meanwhile, the investment horizon is also more and more concentrating on the longer term.

If family firms have engaged in long-term investment, and the actual R&D performance at the current stage is lower than the performance aspirations regarding economic and non-economic wealth acquisition, family firms suspect the current R&D might cause further losses of financial and SEW wealth, and invest more in R&D in order to receive better R&D performance in the future (Chrisman & Patel, 2012). Through such a mechanism of investing in R&D, in the long-term, family firms have a high chance to conduct radical innovation through the accumulation of learning and experiencing R&D. Juxtaposing the above arguments, family firms conduct radical innovation which has strong alignment with the goals of family firms and can show great potential for the future development of firms.

2.3.5.1 RESEARCH GAP OF THE STUDY OF BEHAVIOURAL AGENCY THEORY AND SEW, AND RADICAL INNOVATION

Through the lens of behavioural agency theory and SEW, we summarise that family firms can engage with radical innovation if, first, they have a long-term investment horizon and intention to conduct radical innovation activities by investing in R&D, second, radical innovation is potentially associated with acquiring economic and non-economic wealth (Chrisman & Patel, 2012; Le Breton-Miller et al., 2015). When family firms started to conduct innovation activities, they can act conservatively in terms of tackling high certain innovation activities and be willing to generate short-term benefits. This type of family firm would gradually release conservative tension and engage more with uncertain innovation activities when it has received consistent R&D performance which has met the expectations of family owners (Patel & Chrisman, 2014). Family firms would conduct more risky innovation than before and eventually reach the condition to adopt radical innovation.

Does maintaining SEW always conflict with the decision to take risks? Family firms would gradually take hold of SEW endowment while family involvement is increasing (Gomez-Mejia et al., 2007; Berrone et al., 2012). In such cases of family involvement, family firms would take progressively more risk-averse actions. However, studies have found there is a positive

relationship between family involvement and entrepreneurship behaviour (Konig et al., 2012; Lichtenthaler & Muethel, 2012; De Massis et al., 2014; Chrisman et al., 2015). Family involvement can enhance the family members' power in allocating human capital, social capital and financial capital towards R&D investment (De Massis et al., 2012). At the same time, the increase of family members, especially involving multiple generations, can broader the firms' knowledge in sensing business opportunities (Lichtenthaler & Muethel, 2012; Kraiczy et al., 2014). In this case of family involvement, family firms would increasingly take hold of SEW endowment but at the same time enhance risk-taking behaviour.

Gomez-Mejia et al. (2007) suggested that risk-taking or risk-willing decision behaviour should depend on the maintaining of SEW endowment and rescuing the loss of SEW endowment respectively. SEW entails five dimensions (family control and influence, identification of family members with the firm, binding social ties, emotional attachment of family members, and the renewal of family bonds to the firm through dynamic succession) (Berrone et al., 2012). Which dimension could be identified as the current priority in fitting in current strategies of family firms? Do these SEW dimensions all block family firms' risk-taking behaviour, and, in turn, impede radical innovation at all? Miller et al. (2015) found that there are different aspects of non-economic goals which can lead to different decision behaviours within family firms.

The decision behaviour might be different referring to the dimensions of family identity and transgenerational value (Chrisman & Patel, 2012; Kammerlander & Ganter, 2015). Family firms are less willing to conduct radical innovation because radical innovation might result in changing in family members' control latitudes and diluting their ownership or ruining the identity of family firms (Chen & Hsu, 2016). However, according to Chrisman et al. (2015), family firms shift from being risk-averse towards being risk-willing when the family is currently concentrating on maintaining transgenerational value in the future. Family firms strive for intrafamily succession and conduct radical change in order to increase transgenerational control (Berrone et al., 2012; Chrisman et al., 2015). Therefore, we identified the current research gap of family firms could be a contingent factor which can drive family firms to either place more weight on maintaining transgenerational control than maintaining the identity of family firms or vice versa. In this case, family firms are risk-averse or risk willing even if firms have the same purposes of maintaining SEW endowment.

Research gap 4: Is SEW a multi-dimensional concept that can both support and dilute radical innovation?

2.3.6 ABILITY AND WILLINGNESS, AND RADICAL INNOVATION

Ability entails the discretion of family members to manage family firms' resources towards a strategic direction, and the capability (combination of financial resources, human resources, social capital, and firms' knowledge and experience) of family firms allows them to pursue the strategic direction in question (De Massis et al., 2014). Willingness, however, is related to family owners' goals, intentions and motivations, which can drive family firms to behave in a particular way (Chrisman et al., 2015; Rod, 2016).

When family members are continuously involved in ownership and management, family members gradually take hold of non-economic wealth and conduct fewer innovation activities which are perceived as harmful for losing family control, reputation and identities (Morck & Yeung, 2003; Gomez-Mejia et al., 2007; Gomez-Mejia et al., 2010). While dealing with such innovation, family firms are demotivated to acquire knowledge to innovate, less likely to share control with talented non-family managers, tending to minimise external financing activities (Chrisman et al., 2015). Over time, family firms exhibiting such characteristics are expected to lack resources and capabilities needed for radical innovation and in turn lose the ability towards pursuing radical innovation (Chrisman et al., 2015).

However, compared to non-family firms, family firms have advantages to pursue radical innovation strategies (Chrisman et al., 2015). First, the decision-making process is quicker within family firms than non-family counterparts because family members have power against bureaucracy and jump over the systematic decision-making process (Carney, 2005). While engaging with radical innovation, family firms can react quickly and flexibly (Konig et al., 2013). Second, family patient capital allows family firms to engage with risky but promising projects in terms of tolerating short-term losses and waiting for a longer period of return (Sirmon & Hitt, 2003; Hoffman et al., 2006). Third, centralised family governance structure, close alignment of interests between owners and managers, and effective communication among family members can assist family firms to adopt a radical innovation effectively (Chirico & Salvato, 2014; Covin et al., 2016). The urgent attention we identified then focuses on what attracts family CEOs' attention and increases their willingness to innovate radically.

2.3.6.1 RESEARCH GAPS OF THE STUDY OF ABILITY AND WILLINGNESS, AND RADICAL INNOVATION

The SEW can be identified as the main driver of family CEOs' willingness towards either risk-taking and risk-willing (Gomez-Mejia et al., 2007; Le Breton-Miller et al., 2013; De Massis et al., 2014; Chen & Hsu, 2016). Sometimes, family firms could mainly pursue

economic goals when poor economic performance has put family firms' survivability at stake (Chrisman & Patel, 2012; Kammerlander & Ganter, 2015). In this case, the purpose of pursuing economic goals is to help family firms increase survivability and further maintain SEW endowment (Kammerlander & Ganter, 2015; Li et al., 2016).

Miller et al. (2015) contended SEW dimensions could impact on innovative goal construction and identified two extremes of SEW objectives in line with the decision behaviour of family firms. The first extreme is 'feeding parochial family desires (FPFD)'. Under this specific SEW objective, family firms act conservatively focusing on parochial family interests, and in turn create a risk-averse organisational culture in decision-making. Such risk-averse behaviour can decrease the investment in radical innovation activities and in turn block family firms' ability to innovate through generations. Second, the other extreme of SEW is 'creating an evergreen organisation (CAEO)' in which family firms act proactively in innovation by continuously investing in stakeholders, human capital, and social capital. The vision of this evergreen family firm type is to establish a robust business.

However, we combined Berrone et al. (2012), Chrisman and Patel (2012) and Miller et al. (2015) and then identified that the SEW dimension could be shifted to range between conservative behaviour and innovative behaviour. If the SEW dimension can drive family firms' willingness to start acquiring resources to innovate (Chrisman et al., 2015), family firms can pursue radical innovation when the SEW dimension has reached to the CAEO extreme. The research gap, in this case, is what factors drive SEW to shift towards the CAEO extreme and in turn increase willingness to pursue radical innovation and construct relevant, innovative goals.

Research gap 5: What factors can drive family SEW towards the CAEO dimension, increasing willingness to pursue radical innovation and construct relevant, innovative goals? Does the family owners concerning particular SEW dimensions generate impact on the innovativeness of family firms?

Studies have found SEW is negatively related to radical innovation within family firms (Chrisman & Patel, 2012; De Massis et al., 2013; Konig et al., 2013). Family owners have a strong willingness to maintain/enhance SEW endowment and avoid taking risks generated from a radical innovation (Gomez-Mejia et al., 2007). The relationship between SEW and radical innovation might be different since SEW is separated into CAEO and FPFD (Miller et al., 2015). While increasing family involvement, family owners will increasingly take hold of either CAEO and FPFD which drives family firms gradually enhancing or reducing the degrees with which to pursue radical innovation (Chrisman et al., 2015; Veider & Matzler, 2015).

In addition, the business environment can play an important role in strategic decision-making. Strategic goals are set after analysing the environment regarding demand, market competition and taste of consumers (Le Mens et al., 2015). Sometimes, the volatile environment, including unstable demand, strong market competition and frequent changes in the taste of consumers can put pressure on family CEOs to rethink the current strategic goals as well as the long-term ones. Such a volatile environment can twist long-term strategic goals which were set at the beginning (Venkatraman & Camillus, 1984; Prajogo, 2016).

Both family firms and non-family firms have two aspects in firms' adaptive behaviour: firms create a strategy to match with the current business environment and at the same time diversify firms' capabilities to fit the environmental changes (Andrani, 2001; Venkatraman & Camillus, 1984). In the low dynamic business environment, the future will be more or less like the present (Hamel, 1996; Hannan & Freeman, 1978). The taste of consumers is predictable and changes slowly. In such a context, competitive advantage could be acquired by diversifying products and services and try to act differently from other rivals (Porter, 1996; Sharma & Salvato, 2011). Family firms can implement incremental innovation to maintain survivability and the fitness of the environment. Theoretically, as long as firms are constantly creating strategic fitness, family firms can prevent entering the age of obsolescence (new products will replace the existing products and lead the existing products to become obsolescent in a business market) (Venkatramen & Camillus, 1984; Hannan & Freeman, 1978). In such a low dynamic environmental context, radical innovation is not urgently needed during business development. When discontinuous product innovation is conducted, consumers might have little knowledge and experience while facing new products (Le Mens et al., 2015). It will take a longer period for consumers to understand the new products than those within the highly dynamic environment (Prajogo, 2016). Since discontinuous product innovation can ruin the social identity (one of the SEW dimensions) within consumers' minds, consumers will question the reliability and capability of family firms regarding how the products can compete with the top performers at a similar price level (Sorenson & Stuart, 2000). The consumer can hesitate to choose the new products, which could lead sales growth down the bottom (Le Men et al., 2015). Although radical innovation might be promising in the future, family firms need to stand for a long period of low or no sales profits until consumers have realised the new products are much better than the current ones and decided to switch their minds towards the new products (Prajogo, 2016). Therefore, low environmental dynamism would decrease CAEO intensity and increase FPFD intensity and family firms are less willing to allocate resources towards radical innovation.

When family firms are operating in a highly dynamic environment with high turbulence and uncertainty, and the taste of consumers is changing quickly, continuous improvement within family firms can struggle to track environmental changes (Allen, 2001). Because the taste of consumers is frequently changing, this situation would create a number of niches within the market (Prajogo, 2016). The niches can provide family firms with opportunities to implement radical innovation (Porter, 1980). Family firms, in this case, can act radically and keep generating new products to attract consumers' attention and adopt to the environment (Craig & Moore, 2006; Prajogo, 2016; Venkatraman & Camillus, 1984).

However, the period to adopt a radical innovation is shorter within high dynamic environment than that within a low dynamic environment to generate strategic fit and receive optimum benefits from a radical innovation (Craig & Moore, 2006). CAEO can increasingly take hold and drive family firms to invest more intensively by investing more in R&D.

Because the taste of consumers is frequently changing, this results in old fashioned products becoming outdated; it is difficult for family firms which have little intention to pursue radical innovation to survive. In order to increase the survivability and create strategic fit, family firms would decrease the FPFD intensity and engage in more radical innovation.

However, the study of how environment impact is shifting SEW intensity is limited in family firms and the radical innovation sphere. Evidence also shows highly conservative family firms (e.g. Clarks, Grenson and Leon Paul) act highly innovatively in the later stages of the organisational life-cycle and yet has reached the stage of transgenerational control (Li, 2016). Environmental dynamism could be a logical contingent factor driving family firms to innovate.

Research Gap 6: How does environmental dynamism moderate the relationship between CAEO intensity and degree to pursue radical innovation and the relationship between FPFD intensity and degree to pursue radical innovation within family firms?

2.4 CONCLUSIONS

After examining radical innovation within family firms by systematically reviewing 39 papers published between 2003 and 2016, we found the main investigations are under the theoretical lenses of RBV, agency theory, behavioural agency theory and SEW, and ability and willingness. Within these four theoretical lenses, RBV and agency theory were the leading theories across the last decade; while behavioural agency theory and SEW, and ability and willingness paradox, which were built from 2007 and 2012 respectively, had shown an upward trend in radical innovation and the family firms sphere.

Although the 39 studies of radical innovation and family firms pertained in four different research streams associated with the four theoretical lenses mentioned above, similarities and connections related to how family firms generate radical innovation could be identified in between. The main argument of radical innovation among the four lenses could lie in the alignment among family involvement in ownership and management, resources, governance and goal setting. That is, if family firms have a long-term investment horizon and the proposed radical innovation is in line with the goals and strategies, family firms could have strong willingness to devote to radical innovation by conducting internal financing activities (e.g. acquiring financial support from family members), investment for R&D, and knowledge acquisition for specific knowledge renewal (Sirmon & Hitt, 2003; Chrisman & Patel, 2012; Covin et al., 2016; Cucculelli et al., 2016). By having strong motivation, family firms can have a high chance to adopt radical innovation by the time resources have been accumulated to a certain degree (Cohen & Levinthal, 1990; Chandy et al., 2003; De Massis et al., 2014).

However, if family firms are highly committed to traditional resource and operation trajectories and act conservatively, the firms could not conduct radical innovation even supported by abundant resources. Conservative behaviour could result in a resistance to innovative ideas within firms. In addition, radical innovation would be identified as highly against family owners' willingness. Thus, employees, especially non-family members, would be reluctant to act innovatively in preventing the loss of jobs (Cohen & Levinthal, 1990; Miller, 1993; Zahra, 2005; Zahra, 2012). Over time, family firms would lose non-family employee talent for innovation, resulting in little innovative experience, generating strategic simplicity for innovation, and eventually losing the ability to conduct radical innovation.

In fact, it is difficult to draw family owners' attention to adopt radical innovation because radical innovation contains great uncertainties which might result in loss of financial and non-financial benefits (e.g. SEW). The question then lies in what are the key factors which can drive family firms towards risk-taking. By analysing RBV, agency theory, behavioural agency theory and SEW, and the ability and willingness debates separately, radical innovation adoption could depend on whether family firms have the resource bundle to support radical innovation activities, what is the level of family involvement in ownership and management, and what is the style of governance. However, these mentioned criteria cannot be specified because family firms are highly heterogeneous, which can result in various combinations of resources, levels of family involvement in ownership and management, and types of governance structures. For instance, two family firms having the same level of family involvement in ownership and management, and holding the same resources could result in different goals, strategies, and risk-taking behaviour

CHAPTER 3

THEORETICAL AND CONCEPTUAL TREATMENT OF FAMILY FIRM RADICAL INNOVATION

3.1 Introduction

The study is intended to fill urgent gaps from the previous studies (showing in Chapter 2) by taking a wider range of investigation: (1) SEW dimensions and firm innovativeness and (2) resources and family firm radical innovation behaviours. In the current chapter, it will first extend the investigation of SEW dimensions and firm innovativeness towards family owners' fear of losing SEW dimensions and firm innovativeness; and will then extend family idiosyncratic resources and willingness to pursue radical innovation towards family firms' resources and family owners' willingness to pursue radical innovation. We then created two research questions. *Question one: Does the family owners' fear of future loss of SEW in different dimensions generate different impact on the innovativeness of family firms?* and *Question two: What firm resources can direct family owners' willingness towards pursuing radical innovation?* In this study, radical innovation is defined as radical product innovation.

Innovativeness matches the current theme of investigating family firm radical innovation. Innovativeness is defined as firms' ability and capability to innovate (Filser et al., 2017), which is related to radical innovation (Garcia & Calantone, 2002). For instance, Garcia and Calantone (2002) compared the different testing results which are supported by the empirical data collected by using the different constructs of both innovativeness and radical innovation from previous studies. They found the degree of innovativeness varies from low to high. When firms hold a high degree of innovativeness, it demonstrates these firms have strong ability and capability to innovate, and in turn generate radical innovation (Garcia & Calantone, 2002). Hence, it is worthwhile to investigate firm innovativeness in a family firm context.

The following two sections will begin with the importance of each research question followed by the relevant theoretical mechanisms of how firm innovativeness and family owners' willingness to pursue radical innovation would be influenced (at the firm-level) in each instance. After introducing the relevant antecedents, this paper moves to discuss the hypotheses in the section of the SEW dimensions and innovativeness, and resources and family firm radical innovation behaviours

3.2 THEORETICAL MECHANISMS UNDERPINNING RESEARCH QUESTION 1

3.2.1 RESEARCH QUESTION 1: SEW DIMENSIONS AND INNOVATIVENESS

> *Research Question 1: Does the family owners' fear of future loss of SEW in different dimensions generate different impact on the innovativeness of family firms?*

Firm innovativeness, such as engaging in product development, novelty and experimentation, is important for firms to fit the changing business environment over time (Lumpkin & Dess,

1996; Sciascia et al., 2013). Innovativeness is important to assist family firms in increasing sales, driving firms to grow, and in turn increasing firms' competitive advantages and performance (Sciascia et al., 2015; De Massis et al., 2016). Specifically, it is regarded as crucial for long-term survival (March, 2006). In family firms, innovativeness can be either impeded or enhanced by distinctive family firm characteristics, specifically those pertaining to the maintenance of socioemotional wealth.

Socioemotional wealth is defined as the nonfinancial wealth committed by family owners, consisting of family harmony, firm performance and business continuity (Gomez-Mejia et al., 2007). Such wealth is constituted by five dimensions defined by Berrone et al. (2010): family influence, family identification, binding social ties, emotional attachment and renewal of family bonds (FIBER). Among current family innovation studies, the literature between SEW endowment and innovation activities is currently split into two main streams. First, the main body of studies into family firms' innovation suggests that the distinctive goals of pursuing non-economic wealth (socioemotional wealth) *impedes* family firms' innovativeness (Gomez-Mejia et al., 2007; Chrisman et al., 2010; De Massis et al., 2012; Sciascia et al., 2013; Kammerlander & Ganter, 2015). Because family firms typically exhibit a strong intention to maintain their SEW endowment (Gomez-Mejia et al., 2007; Berrone et al., 2010; De Massis et al., 2012), and in particular during the strategic decision-making process, family firms will act conservatively by carefully assessing whether the subsequent strategic action would result in a loss, harm or damage to its SEW endowment (Chrisman et al., 2014). Preserving SEW, in this case, could be identified as the family owners' mission, and this filters those innovative strategic actions that are perceived as inappropriate (Chrisman et al., 2016). Because of this, family firms are reported to engage in less R&D (Chrisman & Patel, 2012), less novelty (Chen & Hsu, 2009; Huang et al., 2015), and low technological acquisition (Kammerlander & Ganter, 2015). In this respect, the primacy of SEW appears to *demotivate* innovation activity.

Second, other scholars report that socioemotional wealth *enhances* the family owners' degree of willingness to engage in activities associated with innovativeness (Chrisman et al., 2012; Miller et al., 2015). For instance, family firms will engage in more innovation activities before they enter the stage of succession (Chrisman & Patel, 2012). Family owners are concerned about the family's control and influence, and whether the family legacy can be well-maintained by the next generation leaders (De Massis et al., 2016). This leads family owners to consider the firm's continuity (Chua et al., 1999; Chrisman et al., 2012). The purpose of engaging innovation activities in this circumstance is to create long-term economic wealth, which can enhance the perpetuation of the family's values and legacy, and

then reinforce the leadership of the next generation of the owning family (Chrisman & Patel., 2012). In this respect, the primacy of SEW appears to *motivate* innovation activity.

These two competing theoretical assumptions of family firms' innovation have demonstrated that the two parts of SEW dimensions can drive family owners to behave in either an innovative oriented manner or a conservative oriented manner. According to the relationship between SEW and innovation activities as demonstrated above, family control and influence drive family owners to reject the innovation activities which could cause the loss of family influence endowment. While, renewal of family bonds (e.g. transgenerational control, and continuing family legacy and tradition) would encourage family owners to take innovative actions into account to maintain the endowment of renewal of family bonds. Hence, the possibilities of family firms pursuing innovation activities will depend on which SEW dimension is positioning in danger.

It is known that family owners are more likely to protect the SEW from losing rather than extending it (Berrone et al., 2012). In most circumstances, family owners would wish firms to operate and grow in a stable manner (e.g. generating stable firm performance), and then to largely avoid risky behaviours which might damage SEW (Chrisman et al., 2012). However, it might, at the same time, gradually increase family owners' cautiousness in taking risks and induce their negative emotions (fear of losing SEW) while protecting SEW endowment. Rogers (1975) found that the stronger the individual's desire to protect things from being lost, the higher the degree of fear that will be generated during the period of protection. As the fear gradually rises, it could motivate individuals to escape the unpleasant feeling by taking certain actions (Rogers, 1975). The actions, in the situation of family firms, are expected to be conducted in dichotomous ways. For instance, when family owners have a high degree of fear of losing endowment within family influence and identity in the future, family owners will largely avoid risk-taking behaviour, and generate a low degree of innovativeness. Or when family owners have a high degree of fearful emotion into losing endowment in the renewal of family bonds, the innovativeness would be expected to stay to a high degree.

According to Frijda (1993) and Parrot (2001), the willingness of firms to pursue certain innovation activities can be attributed to the subjective emotion of owners and managers, in that negative emotion motivates individuals to search for novelty. De Massis et al. (2014) suggested that adopting innovation activities is based on the willingness of the owners of family firms. Thus, the connection between 'fear' and innovativeness is feasible. According to Kaufmann and Vosburg (1997), negative emotion will lead to cautiousness and raise people's concern about the importance of 'dissatisfaction', and in turn promote creative problem-solving behaviour. For instance, people feel fear of failing a test when the test is

approaching. The degree of fear could enhance these people's attention to seek more effective ways to prepare the coming test. However, negative emotion is stimulated by certain events (Parrott, 2001). In family firms, fear of losing the future SEW is argued to be positive relative to the degree of innovativeness when family owners are highly concerned with translational control (Chrisman & Patel, 2012). It implies that the fear of losing endowment placing on different SEW dimensions can result in different degrees of willingness towards adopting an innovation. Our goal is to investigate whether the fear of losing SEW in different dimensions in the future will increase or decrease the degree of innovativeness within family firms.

In this current study, we seek to extend the family firm innovation literature based on negative emotions and problem-solving theory regarding how the fear of losing SEW in the future as perceived by family owners will, in turn, increase or decrease the level of innovativeness (as a solution) in family firms by viewing the effects with each SEW dimension. Innovativeness is defined as firms' motivation to engage in novelty and experimentation that has the possibility of resulting in new products, services or technological processes (Lumpkin & Dess, 1996; Hult et al., 2005; Hurley et al., 2005; Martin et al., 2006). Innovativeness is the premise of adopting innovation activities which help develop a competitive advantage over time (Miller & Le Breton-Miller, 2005; Sciascia et al., 2013). Thus, remaining engaged in innovativeness has the capacity to enhance the continuity of the family firm. The level to which innovativeness is engaged can be identified as the degree of family firms' commitment to research and development, and innovation activities (Kellermans et al., 2010). However, level of innovativeness might not remain constant (Sciascia et al., 2013; George & Zhou, 2007) because fear might be generated when people attach significant concern to particular SEW dimensions. Thus, preserving SEW will create a psychological engagement between the family owner's fearful emotion and innovativeness. When family owners fear losing SEW endowment, it can trigger certain behaviour to rectify that situation. This is too dissimilar to ideas of dissonance motivating corrective action in motivation theory (Deci et al., 1999). Herein, we suggest that both innovation and staying conservative can reduce the perceived degree of fear instead of exacerbating them. This logic reconciles the two competing positions currently present among studies of family firm innovation. On the other hand, if family owners are confident that the SEW endowment would be well-maintained in the future, family owners will avoid possible actions such as radical innovation because of the perception that the change required by innovation would otherwise cause the loss of SEW endowment. Under the status quo, and assuming inertial forces, a family firm would see innovation as jeopardizing SEW

unless the family owners have determined that the status quo itself holds little promise for maintaining its SEW into the future, which tends to raise the owners' fear of losing SEW.

There are many theories that have highlighted the relationship among feelings, emotions and behaviour, such as positive emotions and problem-solving theory (George & Zhou, 2007), and cognitive dissonance theory (Festinger, 1957). For three main reasons, we grounded this study in negative emotions and problem-solving theory (Baas et al., 2001). First, emotions and problem-solving theory explain how positive and negative emotions can lead to a particular pattern of problem-solving behaviour. Positive emotions appear to lead to divergent thinking and further make unusual associations between two or more things or actions; while negative emotions will raise people's caution in the problem-solving process, demonstrating systematically, critically and carefully addressing the problem, and figuring out what is wrong by each step (George & Zhou, 2007). According to the definitions, positive emotions can reduce the boundaries among isolated events, and encourage people to make connections among the events while they are encountering problems; on the other side, negative emotions could restrict people in solving problems in a systematic way by criticizing the problem-solving process until the problem has been solved (Baas et al., 2001). Therefore, on the surface, positive emotions have a higher chance to engage innovative behaviour than negative emotions. However, negative emotions can, in essence, result in more consistent problem-solving behaviour than that generated from positive emotions (Kaufmann, 2003). Positive emotions can increase people's confidence in handling problems, and enhance people's degree of satisfying the current efforts, and will, at the same time, decrease their motivation towards exploring further (Vosburg, 1998). Although positive emotions could promote relatively more divergent thinking and solutions than those influenced by negative emotions, positive emotions could decrease faster, which could decrease the degree of promoting divergent solutions (Vosburg, 1998). The influence of positive emotions will eventually contribute little to the problem-solving. On the other hand, negative emotions appear to guide people to think systematically and critically, but meanwhile promote people to seek the optimizing strategy/way which to a large extent results in high performance from future scenarios and assumptions (Vosburg, 1998). The constant high tension resulting from the negative emotions increases people's degree of dissatisfaction with the status quo and triggers a search process seeking to change the future (George & Zhou, 2007). Negative emotions, therefore, generate a higher chance to engage in higher innovativeness than that of positive emotions.

Second, the mechanism of cognitive dissonance theory can match the logic between the family firm owner and its managers perceiving the unlikelihood of maintaining SEW in the future and increasing the degree of engagement in radical innovativeness in the future.

When there are discrepancies between two or more cognitions held by individuals, it will raise an unpleasant feeling in these individuals (dissonance) that would further motivate these individuals to reduce these discrepancies by altering their attitudes and behaviours (Festinger, 1957).

Based on the theoretical assumption of cognitive dissonance, family owners might later alter their attitudes towards engaging in innovative behaviour after experiencing the discrepancies between two different points in time and perceiving the state-of-play as regards the maintenance of SEW in the future. As an illustration, assuming two points in time, time 1 and time 2, if family owners have great confidence to maintain SEW in the future at time 1 but perceived SEW would be unlikely maintained in the future at time 2, discrepancies between time 1 and time 2 will raise the unpleasant feelings (dissonance) of the family owners and drive them to seek ways to reduce the discrepancies. Innovation can be identified as an option which would drive family owners to alter their conservative behaviour to generate outcomes that can change the path of the firm. According to Cooper (2012), dissonance could shift the attitudes of individuals from one consistent mode to another consistent mode. To reduce the discrepancies, family owners will act innovatively in a consistent manner other than behaving conservatively. Hence, innovation would be gradually engaged by family owners in the future.

Although cognitive dissonance theory has the potential to explain the relationship between SEW and family firm innovation actions, it is not a suitable theory for this study. Reducing discrepancies by altering attitudes from one (conservative) to another (innovative) is a stepwise process in which the unpleasant feeling generated by cognitive discrepancies should constantly rise individuals' tension on attitudes shifting (Harmon-Jones et al., 2009). However, maintaining the same level of such tension is difficult. While cognitive discrepancies are decreasing, individuals would become more and more confident regarding the increasing degree of self-affirmation (Steele, 1988). At the same time, the level of the tolerance of individuals will spontaneously increase as they are gradually getting used to the cognition discrepancies (Hinojosa et al., 2016). In this respect, the unpleasant feelings generated by cognitive discrepancies will be decreased, which will ease the tension of forcing change on individuals' attitudes towards innovation behaviour.

Hence, within family firms, when family owners perceive a positive view (confident of maintaining SEW in the future) at time 1, and a negative view at time 2 (perceive SEW is in danger in the future) for maintaining SEW, the action (e.g. innovation) of reducing the discrepancies sensed by family owners will be highly incremental because of the stepwise change of innovation behaviour. Therefore, innovativeness forced by cognitive dissonance

will be in a low degree. Second, when cognitive discrepancies exist among the cognitions, and there should be various options which can reduce the different level of discrepancies, individuals will logically select the safest option even though the option might not generate the optimal result of reducing the discrepancies (Frestinger, 1957). Because preserving SEW meets the highest priority during strategic decision-making, more intensive innovation activities are less likely to be selected when there are alternative options (e.g. incremental innovation) having a similar function of reducing cognitive discrepancies with a lower risk of rendering the loss of SEW (Konig et al., 2013). Hence, innovativeness will be expected to a low degree if family owners choose to engage with a few innovative actions. Third, when family owners have perceived two negative situations regarding maintaining SEW would be unlikely in the future, focusing on two different SEW dimensions (e.g. family's influence and control, and family social bond), the actions of reducing the two different cognitive discrepancies would be different. Radical innovation will be unlikely because radical innovation allows firms to exert a high level of energy, a high degree of investment and a high degree of learning which will challenge firms to balance other activities within daily operations (Tushman & O' Reilly, 1996). Fourth, it is difficult to identify the causes of the unlikely maintaining of SEW in the future because family firms are heterogeneous. Also, family owners from different firms might perceive the different degree of SEW endowment, but it would not assert one (SEW endowment) is lower than another. Therefore, family firms will strongly focus on the reduction of cognitive discrepancies on one side and devote little attention to another.

Fifth, the revealing of cognitive discrepancies allows individuals to have experienced the difference which they have never met before (Hinojosa et al., 2017). For instance, a general rule reported that birds fly, which is believed by most individuals. However, when people have noticed that penguins belong to the bird category but cannot fly, it will change these individuals' minds that there exists a kind of bird that cannot fly (Hannan et al., 2007). Sometimes, people refuse to believe what they have never experienced, which will restrict them to one standpoint while they are searching for a solution (Hinojosa et al., 2017). Since the fear of losing SEW endowment results from the unlikelihood of maintaining SEW – a future scenario perceived by family owners, cognitive dissonance is less feasible to fit this study compared to negative moods and problem-solving theory.

In fact, family owners typically believe pursuing a certain degree of innovation activity can bring benefits regarding sales growth and firms' development (Kammerlander & Ganter, 2015). Many family firm innovation studies report that family firms were more innovative at the early stage within their organisational life-cycle (Zahra et al., 2004; Craig & Moores, 2006; Kraiczy et al., 2014). At that stage, family firms even generated more innovation output than

non-family firms (Zahra et al., 2004). However, during firm development, family involvement has increased ownership and control of family owners but, meanwhile, has increased the degree of owners' attention on preserving ownership and control (a dimension of SEW) (Chen & Hsu, 2009). Such intention can guide family owners to think carefully before any strategic action, calculating the losses and damage to the SEW, and benefits that might be gained from the coming strategic action (Matzler et al., 2015). As involvement of family members and family ownership keep increasing during firm development, the innovation outputs, especially the radical ones, will be much less in the later stage of the life-cycle (Chen & Hsu, 2009).

Apart from the smaller amounts of innovation output, evidence shows that family firms are continuously making efforts to engage in a certain degree of incremental innovation activities in terms of investing in R&D, line improvement, and occasionally acquiring technological resources (Zahra, 2005; Block, 2012; Matzler et al., 2015). Based on the family innovation circumstances, on the one hand, it concludes that family owners' attitudes and motivation toward innovation activities remain at a similar level, which to an extent rejects the mechanism of changing from conservative attitudes to innovative attitudes motivated by cognitive discrepancies between maintaining SEW in the future. The motivation of pursuing innovation, especially the radical one, therefore can be based on the degrees of fear of maintaining SEW in the future generating tension to push family firms to innovate.

According to negative emotions and problem-solving theory, when family owners draw great attention to certain SEW dimensions, these owners then have been informed they should keep the endowment from the specific SEW dimension from being lost. The more attention driven by maintaining the SEW dimension, the higher the degree of fear to lose such a dimension could be perceived by family owners. The stronger the negative emotions held by individuals, these individuals would behave more systematically and critically to assess current firms' status, innovation strategies and future directions (Kaufmann & Vosburg, 1997). Depending on which SEW dimension has increased family owners' fear, the innovative behaviour engaged in by the owners can be either high or low degree.

In addition, emotions are changing over time influenced by certain events (George & Zhou, 2007). For instance, current family owners and founders have confidence in maintaining family control and influence during their career but later might start worrying how the renewal of family bonds will be maintained while entering the stage of succession. Family owners then start to maintain the renewal of family bonds dimension through adopting innovation activities (Chrisman & Patel, 2012). Based on the theoretical assumption of negative emotions and problem-solving, when succession is approaching, the fear will be increasing

because family owners will critical worrying the feasibility of whether the innovation they engaged in before is right for the coming events, and behave increasingly radically, which is different from the cognitive dissonance of eventually reducing the discrepancies among the cognitions.

Drawing from negative emotions and problem-solving theory, we propose the level of family owners' fear of losing in certain SEW dimensions will either increase or decrease family owners' intention to engage innovativeness. Preserving SEW meets the high priority and is argued to be associated with either generating or promoting innovation activities in family firms within previous studies (e.g. Chrisman & Patel, 2012; Miller et al., 2015). As family firms are heterogeneous, the rise in fear is expected to explain the situation of family firms that are either innovative or conservative at different points in time.

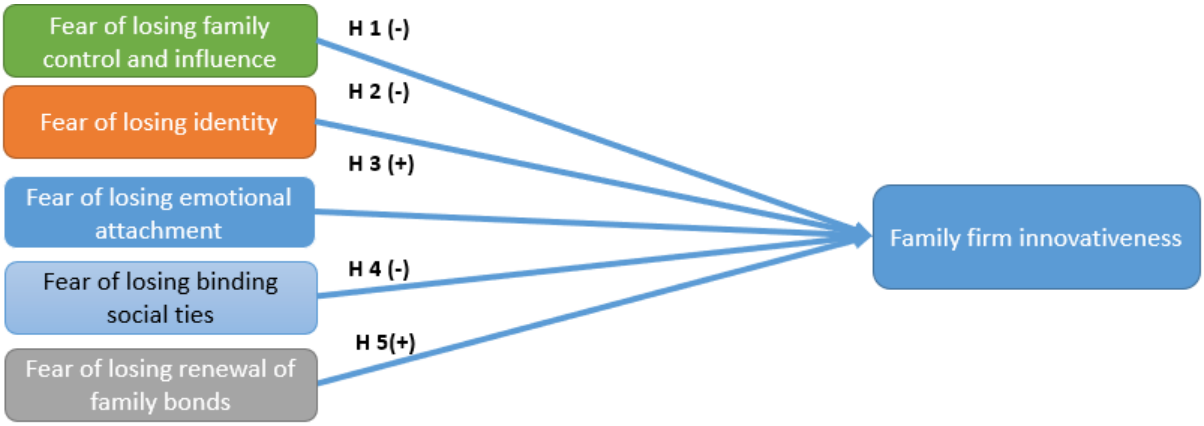
This study intends to make three contributions. First, building on the seminal work by Gomez-Mejia et al. (2007), and George and Zhou (2007), the focus of how and why family firms appear to behave innovatively or conservatively can connect to family governance structures (family involvement in ownership and management and innovation activities), and also family owner's emotions. The intentions of family owners to support innovation activities might be influenced by the fear of loss inspecific SEW dimensions. It tends to reconcile the conflicts and competing findings regarding either positive or negative association between family involvement and degree of pursuing innovation activities (e.g. engaging R&D and technological acquisition). Second, it tends to contribute to a growing body of work regarding innovativeness in family firms by bringing negative emotions and problem-solving into account (e.g. George & Zhou, 2002; Bass et al., 2008) literature in the area of family business. It tends to explore the ways in which family firms can increase the degree of innovation engagement by increasing the concern on how to preserve SEW in the future. Third, this study also intends to contribute to the negative emotions and innovativeness literature, regarding negative emotions can either motivate or demotivate firms' innovation depending on what owners are concentrating on certain events during the specific period.

3.2.2 FEAR OF LOSING SEW DIMENSIONS IN THE FUTURE AND INNOVATIVENESS IN FAMILY FIRMS

The following will be divided into two sections. Section one is the introduction of negative emotions and problem-solving theory regarding where fear comes from, how fear influences the problem-solving behaviour, and how innovativeness could be influenced. Section two will demonstrate the relationship between *maintaining SEW dimensions* and the fear emotion by illustrating the effects of fear of losing family influence, family identification of emotional

attachment dimensions connecting with firm innovativeness, and fear of losing binding social ties and renewal of family bonds dimensions, and firm innovativeness (Figure 3).

FIGURE 3: CONCEPTUAL MODEL FOR MODEL 1



3.2.2.1 THE INTRODUCTION OF EMOTIONS AND PROBLEMS-SOLVING THEORY

Individuals can shift from neutral emotion towards positive or negative emotional state concerning certain events (Mitchell & Madigan, 1984). For instance, when an individual receives rewards (promotion rewards or money rewards) (Hofmans et al., 2013) and supervisor support from a company (Staw et al., 1994), it can raise the individuals' happiness level and meanwhile induce positive emotions; or when individuals encounter problems which they cannot manage and control, demonstrating the success is unlikely. It then has possibilities to raise individuals' pressure and tension concerned with the coming failure and then induce negative emotions (e.g. fear, anxiety and depression) (Richards, 1993). Besides the impact generated by events from a working environment, the inducing of positive or negative emotions can be influenced by the events from daily activities such as watching films and failing exams (Isen et al., 1985).

According to Kaufmann and Vosburg (1997), emotions are associated with creative problem-solving. Positive emotions, such as feeling enthusiastic, excited, inspired, active, strong, and proud, can defocus individuals' attention on a certain area and then increase the level of breadth of cognitive information (Isen et al., 1987; Waston et al, 1988). Positive emotion is connected to loose conceptual boundaries in which Individuals with positive emotions can connect the usual information together and motivate their minds to generate a flexible solution (Isen et al., 1985; Bowden, 1993). Therefore, individuals with positive emotions can access diversified information, which generates the speed of information association and various solutions toward a problem (Murray et al., 1990). However, positive emotions will raise the satisfaction level of individuals on the problem they are dealing with, which can lead these individuals to underestimate the problems with biased thinking and judgements

(Alloy, 1986). In addition, there is a decreasing tendency of the efforts put into creative problem-solving while individuals are holding positive emotions. They will be more satisfied with the solutions they found for treating a problem and be more willing to tolerate the imperfections of the solutions (George & Zhou, 2007). Therefore, compared to the effects brought by positive emotions, negative emotions can lead to more realistic perceptions and judgement during the strategy-making process (Kaufmann & Vosburg, 1997).

Generally, negative emotions include fear, being upset, distressed, nervous and having a hostile mental state, which can increase individuals' level of caution that guides these individuals to consider their environment as problematic (Frijda, 1986; Schwarz, 1990; Vosburg, 1998). The negative emotions could raise individuals' tension on preventing tasks from failure by employing tight, systematic and analytic processes of problem-solving style (Kaufmann & Vosburg, 1997). When an event has induced negative emotions of individuals, it will motivate them to analyze the problems carefully and meanwhile evaluate the strategies they have created (Vosburg, 1997). The problem-solving process then becomes a critical and stepwise circulation in terms of making strategies at the beginning, then critically assessing the strategic limitations and eventually creating new strategies before the next critical strategic assessment (Isen et al., 1987). Under such a restricted process, negative emotions are held to facilitate optimizing problem solutions and generating the best strategic option (Kaufmann & Vosburg, 1997). On the surface, negative emotions motivate individuals to conduct a deeper level of problem-solving process compared to that (diversified information association) promoted by positive emotions, but negative emotions can render a high level of dissatisfaction of current status and at the same time will increase individuals' willingness to depart to searching novelty solutions (George & Zhou, 1998). Comparing the effects generated from positive emotions, negative emotions have the potential to link to the higher motivation of adopting an innovation.

An individual's fear is conceptualised as one of the negative emotions triggered by reacting to the threats (i.e. events which cause or generate (probability of events occurrence) unfavourable feelings perceived by individuals) (Rogers, 1975). There are differences between fear mood and fear emotion. The fear mood is the type of feeling which can be multifacetedly stimulated by various events crossing each other (Foo, 2009). In other words, the fear mood is the summary of how a person feels at the moment, but the reasons for inducing such a mood can be attributed to many (Welpe et al., 2011). Sometimes, individuals have difficulties of demonstrating where the fear mood comes from (Foo, 2009). Because the moods are caused by overlapped events, it is difficult to view the constant relationship between fear moods and innovativeness. On the other hand, the inducing of fearful emotion is strongly connected to a specific reason (Foo, 2009). For instance, if firm

owners hold a mission to protect business legacies from being lost, the high likelihood of losing such legacies has a high chance to induce the owners' fear towards a protection failure (Berrone et al., 2012).

When fear has been induced, it will arouse individuals' motivation to escape such an unpleasant feeling by directing them to search for solutions and even creative solutions (Maddux & Rogers, 1983; George & Zhou, 2007). While, creativity is often identified as an antecedent of innovation (Amabile, 1996), that entails new ideas, principles or concepts. Some scholars viewed creativity as the necessary 'raw materials' for an innovation (Baron & Tang, 2011; McMullen & Shepherd, 2006). On the other hand, creativity is also demonstrating the degree of motivation to engage innovation, which can match the concept of innovativeness (e.g. motivating of engaging novelty) (Lumpkin & Dess, 1996). It is therefore shown as the connections between an individual's fearful emotions and firm innovativeness.

3.2.2.2 FEAR OF LOSING FAMILY INFLUENCE, IDENTIFICATION AND EMOTIONAL ATTACHMENT DIMENSIONS, AND INNOVATIVENESS IN FAMILY FIRMS

The SEW dimension – family control and influence – entails family owners having great power over other non-family employees in strategic-decision making, directing a family firm by following the owners' visions. Sometimes, family owners can make strategic decisions without even asking permission through layers within an organisation (Konig et al., 2013). While family owners are enjoying such power, in the meantime, they could also be worried about losing it (Berrone et al., 2012).

The degree of family influence held by family owners is positively related to family ownership, and the number of top management top positions held by family members (e.g. CEO, board Directors or Chairman of the Board) (Berrone et al., 2012; De Massis et al., 2012). When firms are young, they are owned and managed solely by family members (Berrone et al., 2012; Matzler et al., 2015). In this particular time period, based on the family influence conceptualisation, the level of family influences perceived by family members is high. Family owners have full control over family firms and are confident to keep family influence endowment from being lost. Therefore, the fear of losing the family influence endowment is low. Family firms are reported to be more innovative at a young age than when old (Matzler et al., 2015; Kammerlander & Ganter, 2015).

Innovation allows family firms to invest in human resources (skilled employees), financial resources and technological resources (Chrisman et al., 2015). Family firms will thereafter invest to hire non-family professionals to tackle the innovation which needs a higher degree

of knowledge over that held by family owners (De Massis et al., 2012). Family firms will then witness the increase of non-family employees, which could gradually dilute the family owner's power latitude and control in the long run (Gomez-Mejia et al., 2007). Non-family professionals have better skills in maintaining, stabilising and positioning the innovation in the right trajectory than family members (Singh & Gaur, 2013). Non-family employees, in this case, can be better positioned in some technological departments than family members. Innovation activities will cause an increase of non-family employees within family firms.

However, family owners have nepotistic appointments to appoint family members in managing innovation which could overwhelm non-family professionals' knowledge and skills and then slow down the innovation process in terms of planning, adopting and commercializing (De Massis et al., 2016). When the number of non-family employees increases, the family control and influence endowment perceived by family owners can decrease which will raise family owners' fear of losing family influence endowment and then impede the planning of the next innovation. To escape from the unpleasant feeling, family owners will not select the innovation which has a high risk of causing damage to family influence endowment (Chrisman et al., 2016). We then hypothesize the mediation analysis below.

H1: THERE IS A NEGATIVE RELATIONSHIP BETWEEN THE FEAR OF LOSING FAMILY CONTROL AND INFLUENCE ENDOWMENT AND INNOVATIVENESS WITHIN FAMILY FIRMS.

Family identity is conceptualised as the image overlapping between family members' identity and firm reputation perceived by stakeholders (e.g. customers, family employees and non-family employees) (Berrone et al., 2010). According to Hofstede (1980), an individual's identity can refer to the identity of a group in terms of commonly sharing collective norms and values. Within a family firm, family members' identities are established based on a family, carrying on the family name, demonstrating reciprocal altruistic behaviour (Carney, 2005). Meanwhile, family owners also have brought such 'mutual support' into the firm governance (Sharma & Manikutty, 2005) that family owners would manage to match the benefits of the most family members while making a strategic action, and then share success with the family members (Berrone et al., 2012). Family members then bridge the sense of belonging to a firm, and feel the benefits they devote themselves to acquiring would be derived from the success of the firm (Cennamo et al., 2012). Additionally, firm success can also enhance family members' confidence and commitment towards the firm (Singh & Gaur, 2013).

Apart from the identity in which family members' perception ties with family firms, identity is also perceived by the non-family audience (e.g. customers, potential customers, and

suppliers) (Hannan & Freeman, 1977). During the firm development, firms would continuously generate influence by offering products and services with constant quality and a similar delivery process (Hannan & Freeman, 1984). In a business market, it can then establish a schema within audiences' minds, demonstrating the brand image, product quality, service process and corporate reputation (Sorensen & Stuart, 2000). These factors have created the identity of family firms.

Family firms, especially those passed through generations, have strong intention to protect such identity from being lost (Chrisman et al., 2015) because such identity not only includes the reputation of firms but also the 'face' of family names (Sharma & Manikutty, 2005). Family owners, at the same time, have a fear of losing such identity. Internally, family owners carefully check the quality of products, and the process of delivering services in order to keep the same form; externally, the owners could behave in a similar style to treat their customers and suppliers (Sharma & Manikutty, 2005). In the long-run, family firms will generate a deep impact within a market by presenting strong firm identity.

According to Hannan et al. (2007), a single case of strategic misbehaviour will ruin firms' identity when it has become extremely strong. Family owners understand the importance of adopting innovation activities. However, an innovation would largely generate damage to the family name and reputation which would induce the fear of losing identity endowment. Since the family identity includes the family name and firm reputation (Sharma & Manikutty, 2005), strategic misconduct through innovation will also destroy the family identity. Hence, the increasing identity perceived by family owners will result in dramatic enhancement of fear of losing identity endowment and in turn discourage firm innovativeness. Moreover, when firms' identity is low, which is rarely recognised by audiences, firms can have wider opportunities to adopt innovation (Le Mens et al., 2015). Therefore, when family firms' identity endowment is perceived as at a low degree by family owners, it will induce owners' low degree of fear of losing identity endowment within a market, which can generate a high level of firm innovativeness.

H2: THERE IS A NEGATIVE RELATIONSHIP BETWEEN THE FEAR OF LOSING FAMILY IDENTITY ENDOWMENT AND INNOVATIVENESS WITHIN FAMILY FIRMS.

Emotional attachment is conceptualised as the degree of the emotional role involved in the process of decision making within family firms (Berrone et al., 2012). The family business is a combination of 'family' and 'business' (Sirmon & Hitt, 2003; Carney, 2005). On the one hand, family owners act as the key roles in maintaining business in a proper form (i.e. managing employees, maintaining a relationship with suppliers, and delivering products and services) (Chua et al., 1999). On the other hand, family owners should consider the benefits

of family members while they are making strategies (Schulze et al., 2003), and these owners behave in giving opportunities to altruistic to family members, treating family employees with more trust and benevolence (Berrone et al., 2010; Cennamo et al., 2012). Through a long history, family members have dealt with various types of business events (e.g. innovation activities and problems), which have accumulated shared business experiences, and experiences of maintaining relationships among family members (Carney, 2005). These experiences have shaped the current value and norms of family owners (De Massis et al., 2012), which make family firms different from each other.

Within a high emotional attachment context, family owners and family employees will receive a high level of support, which can help them maintain a positive self-concept (Berrone et al., 2012). It provides a feeling to signal a family firm is a place for belonging, which will increase family owners' and family employees' general satisfaction and level of wellbeing (Sharma & Manikutty, 2005). With such context, family owners and family employees will be confident of the current and future business actions. Hence, the high emotional attachment will result in a high level of job commitment, and a high degree of communication efficiency which allows family firms to engage in innovation quickly (Tushman & O' Reilly, 1996).

Although emotional attachment can be positively associated with innovation effectiveness, the decision to pursue innovation should be based on the family owners' intention to adopt innovation activities (De Massis et al., 2016). The evidence demonstrated family owners would not engage in risk-taking behaviour (e.g. Chrisman et al., 2012; Kammerlander & Ganter, 2015). One of the reasons that can be attributed to innovation is that it could create change that will enhance family members' fearful emotion towards losing the benefits which they previously received (Konig et al., 2013). In addition, since a high emotional attachment context has created a strong family value, it will continuously reinforce the family legacy which will highly impede family owners to engage in high innovative behaviour (Sirmon & Hitt, 2003). Family members are afraid of losing the family legacy which has been created by previous family leaders (Chrisman et al., 2015). Finally, the high emotional attachment will emphasise altruistic behaviour which will increase the 'free riders' and in turn raise the dysfunctionality in management and lack of technical skills (Carney, 2005). Therefore, a high emotional attachment context can increase family owners' fear of losing the endowment within such a dimension, and further result in low motivation to pursue innovation activities.

In low emotional attachment circumstance, although family owners have powers to jump over the process and make a strategic decision in a quick way, most of the time, the process of making strategic decisions are guided by formal rules without strongly considering the benefits of other family members. Family owners have less fear of losing emotional

attachment endowment, in which family firms then have better opportunities to tackle wider innovation activities, which can result in higher possibilities of engaging innovation (Chrisman et al., 2016).

H3: THERE IS A NEGATIVE RELATIONSHIP BETWEEN THE FEAR OF LOSING FAMILY EMOTIONAL ATTACHMENT ENDOWMENT AND INNOVATIVENESS WITHIN FAMILY FIRMS

3.2.2.3 FEAR OF LOSING FAMILY BINDING SOCIAL TIES, RENEWAL OF FAMILY BONDS, AND INNOVATIVENESS IN FAMILY FIRMS

Binding social ties are conceptualised as the social capital established by family firms (Hoffman et al., 2006; Berrone et al., 2012). In the family firm context, social capital includes the strong ties among family members, and connections with non-family employees and external communities (e.g. local charities and events) (Schulze et al., 2003). Internally, strong family ties have demonstrated a high degree of trust and level of reciprocity altruism and interactions among family members (Nahapiet & Ghoshal, 1998; Sirmon & Hitt, 2003). Family members behave with commitment to the mission and goals, and generate effective communications, which can facilitate fast knowledge internalisation, quick flow of information and high speed of strategic decision-making (Arregle et al., 2007; Chirico & Salvato, 2014) which are crucial for pursuing innovation (Konig et al., 2013).

According to Sirmon & Hitt (2003), social capital is a reciprocal bond, providing benefits (economic and non-economic benefits) to those who are surrounded by it. As social capital increases, it attracts individuals' expectations in terms of what they could acquire in the future. The reciprocal family bonds will be extended while non-family employees are kept involved. The purpose of generating such influence is to create a sense of belonging shared by all employees within family firms to establish a stable and highly committed working environment (Miller & Le Breton-Miller, 2005). Non-family employees, in the meantime, are also expected to receive generous actions as the firm conducted to family members (Schulze et al., 2003).

Externally, family firms constructed a deep relationship with the customers and channel partners, which has provided the possibilities of adopting innovation (Sirmon & Hitt, 2003). In family firms, the aim of strategies, sometimes, should reduce costs, minimise risks and promote a stable development process (Perez-Luno et al., 2011). However, the idea behind innovations (especially radical ones) allowing firms to invest a large amount of money into darkness will work against the strategic origin (Pere-Luno et al., 2011). Deep relationships with external entities can build up collaborations to deal with innovation by sharing tacit knowledge (e.g. customer data and know-how) (Hoffman et al., 2006). The risks from an

innovation activity will be eased to a large extent. In addition, strong external social ties cannot only undertake the risks from a coming innovation but also offer opportunities which are the premises towards pursuing innovation (Sirmon & Hitt, 2003). Additionally, the shared data and information can reduce the risks of launching innovative products, which will motivate family owners to innovate (Covin et al., 2016).

These external social ties are identified as part of the heritage built by former family leaders and are accumulated through the development of the firm (Sirmon & Hitt, 2003; Gomez-Mejia et al., 2007). It is therefore the case that family owners have strong intention to pass the social ties to the next generation of leaders through encouraging the successors to join in social activities and events, and sending these successors to train in partners' firms early in their careers (Miller et al., 2015).

Strong social capital allows family firms to accumulate and sustain themselves over the years (Hoffman et al., 2006). On the one hand, family owners are afraid of losing such endowment and then to avoid any changes which might cause damage to it (Kammerlander & Ganter, 2015). The motivation of pursuing innovation from family owners would be low if the planned innovation activities would result in loss of social capital (Chrisman et al., 2016). This perspective will generate possibilities to enhance deep tacit knowledge sharing (Perez-Luno et al., 2011). In addition, because family firms understand external social capital can provide benefits, the fear of losing social capital will motivate family firms to establish new partnerships to rely on, and in turn enhance the motivation of corporation and innovation (Nahapiet & Ghoshal, 1998).

Finally, during the firm development, continuous recruiting of non-family and family employees is expected to be influenced by firm values and norms that will increase the knowledge stock, commitment and productivity (Chrisman et al., 2007). Although reciprocal bonds have provided more opportunities for family members to take advantage of, it does not assert that the benefits received by non-family employees are overlooked by family owners (Schulze et al., 2001). The core value of family firms is to pursue family harmony, establishing a high degree of trust, and treating non-family employees as part of the family (Gomez-Mejia et al., 2007).

However, the dynamic internal social capital will increase the difficulties for family owners to manage. On the one hand, family owners should protect their ownership and control while new non-family employees are increasing (Carney, 2005); on the other hand, they need to motivate non-family members by continuing to offer generous benefits (Schulze et al., 2001). The dynamic internal social capital would raise difficulties for family owners to maintain over time (Carr et al., 2011), demonstrating the unlikelihood of maintaining the endowment in the

future. It will raise the family owners' fear of losing the endowment of social capital and motivation to adopt innovation to tackle the dysfunctionality (e.g. low non-family employees commitment and low productivity) caused by inappropriately maintaining the internal social capital (Carr et al., 2011; Chrisman & Patel, 2012).

H4: THERE IS A NEGATIVE RELATIONSHIP BETWEEN FEAR OF LOSING BINDING SOCIAL TIES ENDOWMENT AND INNOVATIVENESS WITHIN FAMILY FIRMS.

Renewal of family bonds are the central aspects of family firms conceptualised as the degree of family owners' intention to maintain family legacy and tradition by passing ownership and control through generations (Gomez-Mejia et al., 2007). Generally, family owners are unlikely to consider selling their business, and attempt to preserve ownership and control not only in the current stage but also for the next generation by presenting the long-term investment horizon (Chua et al., 1999; Sirmon & Hitt, 2003; Berrone et al., 2010). Since family owners believe long-term investment would benefit family firms in pursuing long-term sustainability (Chua et al., 1999), when family owners draw strong attention to maintaining renewal of family bonds, the owners will prefer long-term investments to short-term ones (Sirmon & Hitt, 2003). Such investment behaviour has created a favourable context to connect family owners' willingness with innovation activities regarding family owners extending the timeframe of strategic decision-making (Chrisman & Patel, 2012).

Successful transferring of a business to the next generation leaders is one of the important goals in family firms (Chua et al., 1999; Berrone et al., 2012). However, the process of transferring between family founders and successors is difficult. First, family founders have long tenure which would establish strong leadership in terms of employees (both family and non-family employees) being highly committed to the family founder and are confident the founders will guide them to success (Matzler et al., 2015). When family firms have entered the stage of succession, the possibilities of changing a firm leader will enhance the uncertainties perceived by employees regarding future development (Singh & Gaur, 2013). For instance, in the era of family founders controlling family firms, employees share the vision with the founders (Chua et al., 1999). Once the second generation leaders take over control, the vision might shift, which allows employees to spend time shaping their new belief which can cause low productivity and low employee commitment during the leaders' probation periods (Chua et al., 1999). Especially, the high intention of managerial entrenchment and conflicts conducted by family members over the succession period will harm the firm development (Berrone et al., 2012).

The problems which will be generated during the succession period perceived by family owners will enhance their level of attention on maintaining the renewal of family bonds.

When the endowment of renewal of family bonds stays at the high level perceived by family owners, it demonstrates family owners have a high level of intention to transfer the current business to the next generation leaders. However, problems (e.g. managerial entrenchment and low employees' commitment) can emerge during the succession period that will increase family owners' fearful emotion towards losing the endowment from such a dimension. To overcome these problems, family owners will be encouraged to support innovation activities to reinforce the leadership of second-generation leaders and store financial wealth to sustain the business (Chrisman & Patel, 2012). In this case, the high level of fear of losing endowment within renewal of family bonds received by family owners will result in a high degree of family firms' innovativeness.

When the endowment of renewal of family bonds is at the low level perceived by family owners, it shows that family owners have low intention to transfer the current business to the next generation leaders. In such circumstance, family owners will prefer to maintain the family control influence by preserving ownership and control and having a low degree of fear of losing the endowment within the renewal of the family bonds dimension. Hence, family owners will have low motivation to support innovation activities because they are afraid that the innovation will damage ownership and control. When the degree of fear of losing endowment in the renewal of family bonds is low as perceived by family owners, it will result in a low degree of innovativeness within family firms.

H5: THERE IS A POSITIVE RELATIONSHIP BETWEEN FEAR OF LOSING THE RENEWAL OF FAMILY BONDS ENDOWMENT AND INNOVATIVENESS WITHIN FAMILY FIRMS.

3.3 THEORETICAL MECHANISMS UNDERPINNING RESEARCH QUESTION 2

3.3.1 RESEARCH QUESTION 2: RESOURCES AND THE FAMILY FIRM RADICAL INNOVATION BEHAVIOUR

> *Research Question 2: What firm resources can direct family owners' willingness towards pursuing radical innovation?*

Firms possess many forms of resources and family firms, in particular, have been studied for their unusual capital stocks compared to their non-family counterparts (Chirico & Salvato, 2014; Covin et al., 2016; Chua et al., 2017). For example, research exists on patient capital, family social capital and family human capital due to the unique features of a family firm (Sirmon & Hitt, 2003). In terms of patient capital, family firms can bear an ability to invest with a much longer-term time horizon; their social capital is differentiated by unique family ties; and human capital is frequently shaped by nepotistic appointments and the dominance

of family members (Carney, 2005; Cesinger et al., 2016). Absent from research to date has been a wider analysis of the firm, instead of family, resources and their implications for the family firm's innovation activities. This is in recognition of a shift in family firm research away from family firms as different to non-family firms and towards a recognition that family firms themselves are not homogeneous (Stanley et al., 2017; Pittino et al., 2017; Blanco-Mazagatos et al., 2017).

In terms of firm resources, these can range from financial, to technological, to knowledge, to marketing resources as just a few examples of their conceptualisation. In terms of radical innovation, firm resources are particularly important because they can place different enablers and constraints around a family firm's innovation activity (Sirmon & Hitt, 2003; Covin et al., 2016) and carry the ability to steer the attention of managers and employees on adopting radical innovation activity (Kyriakopoulos et al., 2016). In the parlance of family firm innovation research, then, firm resources (and not just family idiosyncratic resources) can alter the willingness and ability of family firms to innovate radically. To theorise and enable sufficient predictions of the effects of family firms' firm resource stocks on radical innovation, the resource-based view (RBV) as a guiding theory is not enough because it does not satisfactorily account for how resources drive decision-making to do with innovation. For example, Debruyne et al. (2010) find that high stocks of marketing resources can diminish firms' beliefs about the power of competitor innovation and exaggerate their belief in their ability to respond to competitor's innovation. Makadok (2003) also found that while renowned ship proved resource-based advantages, their ability to do so is mitigated by investment decisions in 'safe bets' and underinvestment on resources of unknown value, neither of which are commensurate with radical innovation. Kyriakopoulos et al. (2016) extend this debate by showing that specific resources diminish the family owners' willingness to innovate radically (comparable with radical innovation) and the ability of the firm to profit from these activities subsequently. These suggest that resources have attention-guiding properties with respect to innovation activity. This matter has not been addressed in family firm innovation research. To solve this problem, an attention-based view of the firm is needed to provide sufficient theoretical treatment.

The attention-based view of the firm (Ocasio, 1997) can complement the resource-based view of the firm by bridging the theoretical gap between the ownership of resources and subsequent strategic action. The attention-based view is defined as managers interpreting firms' ability and business environment, and then making sense of strategic implementation with clear agenda with adaptation and change (Ocasio, 1997; Joseph & Ocasio, 2012). Generally, the attention-based view is a theoretical basis to consider how the organisational activity is informed by the information, resources and process urges acting on the firm and

its owners and managers (Joseph & Ocasio, 2012). The pursuit of innovation activities is based upon the willingness of family firms in which radical innovation is less likely pursued without a willingness to do so, even if family firms have sufficient resources for the innovation (De Massis et al., 2016). This argument contended by De Massis et al. (2016) rejected that family firms would pursue radical innovation when the resources or resources stock are accumulated to a sufficient level of supporting the innovation activities. The valuable resources held by a family firm steer it towards activities that those resources can either enable or support, or away from actions and activities that may endanger those resources. Valuable resources can then act as attention-guiding mechanisms to embellish the position in the attention-based view that strategic managerial decisions are a product of what and to where their attention is directed. For example, a recent study reports that different marketing resources can both motivate and demotivate radical innovation activity and have alternative effects for commercialisation (Kyriakopoulos et al., 2016).

Following the theoretical concepts and apparatus found in RBV theory and the attention-based view, we are compelled to investigate what firm resources are important to drive family owners' willingness to pursue radical innovation. Before discussing the expected firm resources, it is necessary to go through the definition of RBV and further the mechanisms of how RBV is important to family firm innovation activities. Later, it will involve the attention-based view to explain the relationship between firm resources and family owners' willingness to pursue radical innovation within family firms.

3.3.1.1 RESOURCES AND RADICAL INNOVATION WITHIN FAMILY FIRMS

The resource-based view (RBV) defines strategically important resources as those that are valuable, rare, imperfectly imitable and non-substitutable. Such resources held by a firm can help generate sustained competitive advantage and high firm performance in the business market (Barney, 1991). Resources in the RBV are conceptualised as those that are a valuable and unique resource or form valuable resource stocks that can assist firms to strengthen their abilities and enhance their effectiveness and efficiency, and at the same time decrease the possible risks which might threaten business performance (Barney, 1991). For instance, high-intensity learning and communication training can help employees increase knowledge stock, strengthen their relevant professional skills and enhance the efficiency of communication. Employees will not only have stronger ability to deal with higher job demands and more difficult tasks, but also have a wider strategic paradigm in sensing current business opportunities with relevant strategies, and have better communication to implement strategies in an effective way (Chirico & Salvato, 2014). Thus, a training programme in line with employees' knowledge stock, skills and communication system is a

valuable resource stock for firms to sense wider business opportunities and implement faster strategic processes and, in turn, establish competitive advantages.

However, it is difficult for firms to sustain such competitive advantages if rival firms can easily or readily acquire similar resources or imitate them in a reasonable timeframe (Barney, 1991). For example, after new products are launched and had success in terms of increased market share, higher profitability or enhanced market position, those products can draw rivals' attention and motivate them to acquire resources similar to the successful firm (Harabi, 1995). If rivals can rely on similar or substitute resources and then generate better quality products and services that better favour the customers' needs, the firm can lose their competitive advantage and market position (Barney, 1991). In effect, the market is taken away from them by those firms better able to innovate with their resources and do so to disrupt markets (Wright & Hitt, 2017). In order to maintain competitive advantage, the resources, in this case, should be rare in the market and imperfectly imitated by rival firms. In other words, resources should be complex, intangible and dynamic in ways that can generate isolation within a market (Habbershon & William, 1999). For instance, intangible resources such as tradition and long history held by old family firms are rare and can be difficult to imitate by young family firms (let alone non-family firms). In this case, young family firms cannot gain similar competitive advantages in tradition and history aspects than those within old firms.

In order to maintain competitive advantages, Teece et al. (1997) suggest firms should regularly renew their resources to fit the current business environment, and shed resources which are outdated. First, over time, more and more competitors can find ways to access similar or even better resources to replace or substitute the current ones (Teece et al., 1997). As competition strengthens, the margin of the benefits generated from the resources becomes less than before. Second, some resources may only be valuable for a certain period because of the change in consumers' tastes (Prajogo, 2016). For example, there was a high demand for typewriters 40 years ago, but the market demand for the typewriter suddenly decreased after the computer was invented (Bolter, 1991). The computer generated a strong impact on typewriter resources such as the knowledge and skills held by typewriting firms becoming outdated. This also speaks to the sustainability of technological resources. Although some parts of skills and knowledge from typewriting can be reused in the area of keyboard making, the total value generated from the skills and knowledge became less and less valuable.

3.3.1.1.1 Resources Held by Family Firms and Radical innovation Activities

Many studies of family firms' innovation believe there is a positive relationship between the resources held by family firms and their innovative outputs (Habbershon et al., 2003; Sirmon & Hitt, 2003; Carney, 2005; De Massis et al., 2012; Chrisman et al., 2012; Chrisman et al., 2013; Covin et al., 2016). After integrating the studies, such as Sirmon and Hitt (2003), Hoffman et al. (2006) and Chirico and Salvato (2014), in the areas of family firms and non-family firms, family firms hold idiosyncratic and family-specific resources they can take advantage of to facilitate radical innovation. There are three unique resources that differentiate family firms from non-family firms. These resources are patient capital, social capital, and human capital (Sirmon & Hitt, 2003). Family patient capital is identified as the financial capital raised mainly from family members (Sirmon & Hitt, 2003; Chrisman & Patel, 2012). The formation of patient capital can be attributed to one specific reason, i.e. family members have strong attempts to preserve SEW endowment and prevent external financing entities from sharing in the ownership of the firm. On the one hand, patient capital is limited for family firms to inject money into large innovation projects; on the other hand, there is no strict rule for the period of return, which can help family firms tolerate risk-taking with long-term return (Sirmon & Hitt, 2003; Miller et al., 2015). As for radical innovation, it allows family firms to make continuous investment in conceiving, planning and projecting (Kammerlander & Ganter, 2015; De Massis et al., 2016). The deep pocket of patient capital is beneficial for family firms to keep radical innovation projects continuously operating.

Family social capital encompasses the unique and family 'strong' ties, which the family firms could rely on while pursuing radical innovation. Internally, family firms consist of family members as the dominant workforce. It creates a strong family working context for family employees to share information and knowledge through deep interaction and trust (Sirmon & Hitt, 2003). The family working context has been associated with internal effectiveness and efficiency and can enhance knowledge stock to facilitate a radical innovation (Chrisman & Patel., 2012). Internally, such a context motivates deep knowledge and information sharing which is crucial for the fast speed of strategic implementation towards radical innovation (Kammerlander & Ganter, 2015).

Lastly, family human capital may play a significant role in supporting radical innovation. First, family members have complex and deeply-held tacit knowledge (Carne & Ireland, 2013). Family firms typically bear an intention to foster the next generation of family leaders by sending children across different levels, functions, and departments (Carne & Ireland, 2013; Gomez-Mejia et al., 2007). During the training period in a family environment, children are often equipped with deep tacit knowledge and work experience which enable them to

recognise opportunities and then seek to generate product recombination (Konig et al., 2013). Second, long-tenure family owner-managers who have deep firm-tacit knowledge are more likely to be innovative as they have abilities to recognise opportunities by referring to firms' historical innovative strategies (Carne & Ireland, 2013; Matzler et al., 2015). Hence, strong family human capital is a crucial factor for family firms to pursue radical innovation. According to Matzler et al. (2015), family firms are more innovative than non-family firms at the early stage of the organizational life-cycle not only because of family contexts enhancing internal effectiveness and efficiency, but also the organisational structure of family firms is more flexible than non-family firms.

Family firms have advantages to pursue radical innovation. According to Carney (2005), the family business is the combination of 'family' and 'business' in which the overlap has the potential to reduce the cost of monitoring actions and governance. Hence, withholding family specific resources (patient capital, social capital and human capital), family firms should be in a position to innovate at least as well and as much as non-family firms.

However, the family firm is identified as a less innovative business type compared to non-family firms among some studies (Chrisman & Patel., 2013; De Massis et al., 2014). As for pursuing innovation, family firms manifest different innovation behaviours. Some are parsimonious and conservative, focusing on maintaining daily operations without thinking of renewing and extending capability; some are innovative and are prone to enrich their current ability and combine new resources (e.g., technological resources and human resources) with current ones to generate new products or processes (Carne & Ireland, 2013; Miller et al., 2015). De Massis et al. (2014) conceptualised mechanisms of abilities and willingness among family firms towards the pursuit of goals. In order to direct family owners' attention to reach certain goals (e.g., in our case radical innovation), family members should have the discretion to allocate, add-on, and shed resources (abilities), and these abilities are enhanced by levels of family involvement in ownership and management. Meanwhile, family members should have the willingness to pursue innovation but within the parameters of set goals. However, family involvement has a positive relationship with resource discretion, but it does not necessarily relate to willingness enhancement towards the pursuit of radical innovation (Chrisman et al., 2016). Resources (patient capital, social capital and human capital) for radical innovation would not necessarily support the action because the family firm may have no intention to pursue such innovation.

Konig et al. (2013) reported that family firms have better stamina and effectiveness, and are flexible towards the pursuit of radical innovation once the decision of conducting radical innovation is made. Chrisman and Patel (2012) suggested family firms are more innovative

when the pursued innovative outcomes are better than the expectation. However, Chrisman and Patel's (2012) findings are not generalizable into situations in which family firms have no intention to innovate at all. When innovation is identified as a necessary activity as firms have entered the age of obsolescence (Stinchcombe, 1965; Hannan & Freeman, 1984), Chrisman and Patel's (2012) findings then became limited. Based on Konig et al. (2013) and De Massis et al. (2014), the key problem waiting to be resolved is: how can family firms enhance the degree of willingness to pursue radical innovation?

3.3.1.1.2 The Attention-based View, Resources and Family Firms' Willingness to Radically Innovate

From the point of view of resources and radical innovation, the focus can shift from the relationship between resources held by family firms and innovation outputs towards what resources drive family owners' *attention* towards pursuing radical innovation. Firstly, family firms are different from non-family counterparts as the implementation of strategic decisions should carry as little decreasing or negative effects on SEW endowment. Based on the RBV, family firms' idiosyncratic resources have positive effects on the pursuit of innovation activities (Sirmon & Hitt, 2003; Carnes & Ireland, 2013). However, the strength of family firms' idiosyncratic resources results from the increase of family involvement (Chua et al., 2018). As family involvement is positively associated with SEW endowment, it would limit the innovation options because of the attention raised on SEW preservation (Miller et al., 2015). In this case, the relationship between family firms' idiosyncratic resources and radical innovation is hard to explain through the lens of RBV but is revealed through the attention-based view.

Through the lens of the attention-based view, resources have different characteristics which can direct managers' attention towards radical innovation (Kyriakopoulos et al., 2016; Ocasio, 1997). Based on the concept of an attention-based view, resources can either enhance or reduce the willingness of family firms to pursue radical innovation. For instance, reputational resources would increase family firms' willingness to pursue radical innovation because the stronger brand image (brand awareness within a marketplace) and corporate image have the large extent to attract more customers to purchase new products, and more business cooperation (Morgan, 2012).

The family firm is a broader pool than solely its family resources, however, firm resources such as financial resources (e.g., external financing), technological resources, marketing resources (e.g., market knowledge, brand assets), relational resources (e.g., wider business relationships such as channel relationships) and human resources (non-family employees, education, experience) are all conceptualised as firm resources (Srivastava et al., 1998;

Hooley et al., 2005; Kor & Mahoney, 2005; Morgan et al., 2006; Morgan, 2012; Gaur et al., 2014; Krush et al., 2014; Zhao et al., 2015; Davcik & Sharma, 2016). Marketing resources, for example, exist in the business environment and are relied on by firms for the purpose of value creation (Morgan, 2012; Srivastava et al., 1998). But their effects on radical innovation can vary owing to their attention-guiding properties. For example, Kyriakopoulos et al. (2016) found that strong market knowledge resources direct attention towards the needs of currently-served customers such that visions of new markets fail to emerge. These effects are independent of family reuses. Firm resources are similarly capable of motivating family firms towards radical innovation or capable of constraining their actions in pursuit of radical innovation. By investigating firm resources and radical innovation through an attention-based view, it can resolve the paradox of which family firms hold sufficient resource stocks but have low willingness to innovate.

3.3.1.2 THE SELECTION OF FIRM RESOURCES FOR THE CURRENT STUDY

After integrating the studies with respect to resources and innovation activities in family and non-family firms (e.g. Sirmon & Hitt, 2003; Morgan et al., 2006; Covin et al., 2016; Kyriakopoulos et al., 2016), we have identified that family firm resources are composed of two groups of resources: marketing resources and family idiosyncratic resources. These are particularly important for the degree of family owners' willingness to pursue radical innovation.

Family firm resources in our study are conceptualised as the aggregation of market knowledge, technological resources, financial resources, human resources and family idiosyncratic resources. Marketing resources are theorised as the 'raw materials' serving for strategic actions, encompassing tangible and intangible resources which are accumulated from the external business environment (e.g. investment and business cooperation) (Srivastava et al., 1998; Morgan et al., 2012). These resources contain marketing knowledge, reputational resources and relational resources from the external environment (Morgan et al., 2006).

Market knowledge is conceptualised as the knowledge of competitors (such as the price, product and promotion offered by competitors), stocks of customer data, and experience of doing business (e.g. marketing and sales, operation, and cooperation) and knowledge of partners in a marketplace (Kyriakopoulos et al., 2016). Meanwhile, reputational resources contain the strength of corporate image and brand image perceived by the market audience (e.g. consumers, customer and channel partners) (Morgan, 2012). Lastly, relational

resources are described as the strengthening of the relationships with customers, suppliers and channel partners (Morgan et al., 2006).

Technological resources are defined as the patents, technical experience and scientific knowledge which is accumulated over time and currently held by firms (Kim et al., 2016). Technological resources are often accumulated through past technological experience, acquisition from the external business environment (Capron et al., 1998; Eisenhardt & Martin, 2000). Technological resources are expected to advance firms' products to create non-imitable advantages (Kim et al., 2016).

Financial resources are defined as the ability to access the level of external financing such as cash and capital that is crucial for accumulating financial capital (Morgan et al., 2006). The different firm has different abilities to access external financial resources such as bank loans, external venture capital or issue bonds, which the firms could rely on for supporting strategic implementation (Mintzberg, 1987).

Human resources are conceptualised as the available non-family personnel's' individual-level experience, knowledge, and skills within a market, which the firms could rely on for the purpose of pursuing strategic goals (Diamantopoulos et al, 1994).

Meanwhile, *family idiosyncratic resources* are the bundle of owning-family member resources. It includes family patient capital – the financial resources pooled internally from family members which have longer period of return and can withstand the venture investment compared to the external financial resources from the bank and other financial institutions (Sirmon & Hitt, 2003), family social capital – the interpersonal relationships, shared value and trust among family members (Chirico & Salvato, 2014), and family human capital – the knowledge, skills, knowledge, experience and capabilities of current family employees that allow family firms to pursue certain strategic actions (Coleman, 1988; Sirmon & Hitt, 2003)

Marketing resources and family capital are different, taking financial resources and family patient capital as an example. First, financial resources are defined as the ability to access external cash and capital available within the external market that the firms could rely on for possible strategic actions (Hoffman et al., 2006). However, family patient capital refers to monetary assets – cash and business assets – owned by family members or together that firms could use to create value serving economic and non-economic purposes and withstand a long-term period of return (Danes et al., 2009).

Apart from the family patient capital, family firms may conduct wider financing activities depending on different family firms' abilities to raise funds. As for small and young family

firms, the family owners normally fund their firms with personal savings (Kushnirovish & Heilbrunn, 2013). The loans offered by large banks have indirect transaction costs, for the purpose of shortening the loans' longevity (Danes et al., 2009). It would be difficult for these small and young family firms to manage such loans with scarce firm assets. In order to raise external funds, the small and young family firms will share large ownership to some extent with the banks. Instead of raising external funds, they will likely to raise funds among family members as a form of patient capital (Sirmon & Hitt, 2003). As for large family firms, they can conduct wider external financing activities with banks and other financing communities (Hoffman et al., 2006). Compared to small family firms, first, large family firms have stronger abilities to find additional financial resources to cover wider radical innovation possibilities; second the proportion of shared ownership out of the overall family shares with banks is less than that within small and young family firms, which can ease family owners' attention on preserving SEW endowment when the coming radical innovation will largely benefit family firms in the future.

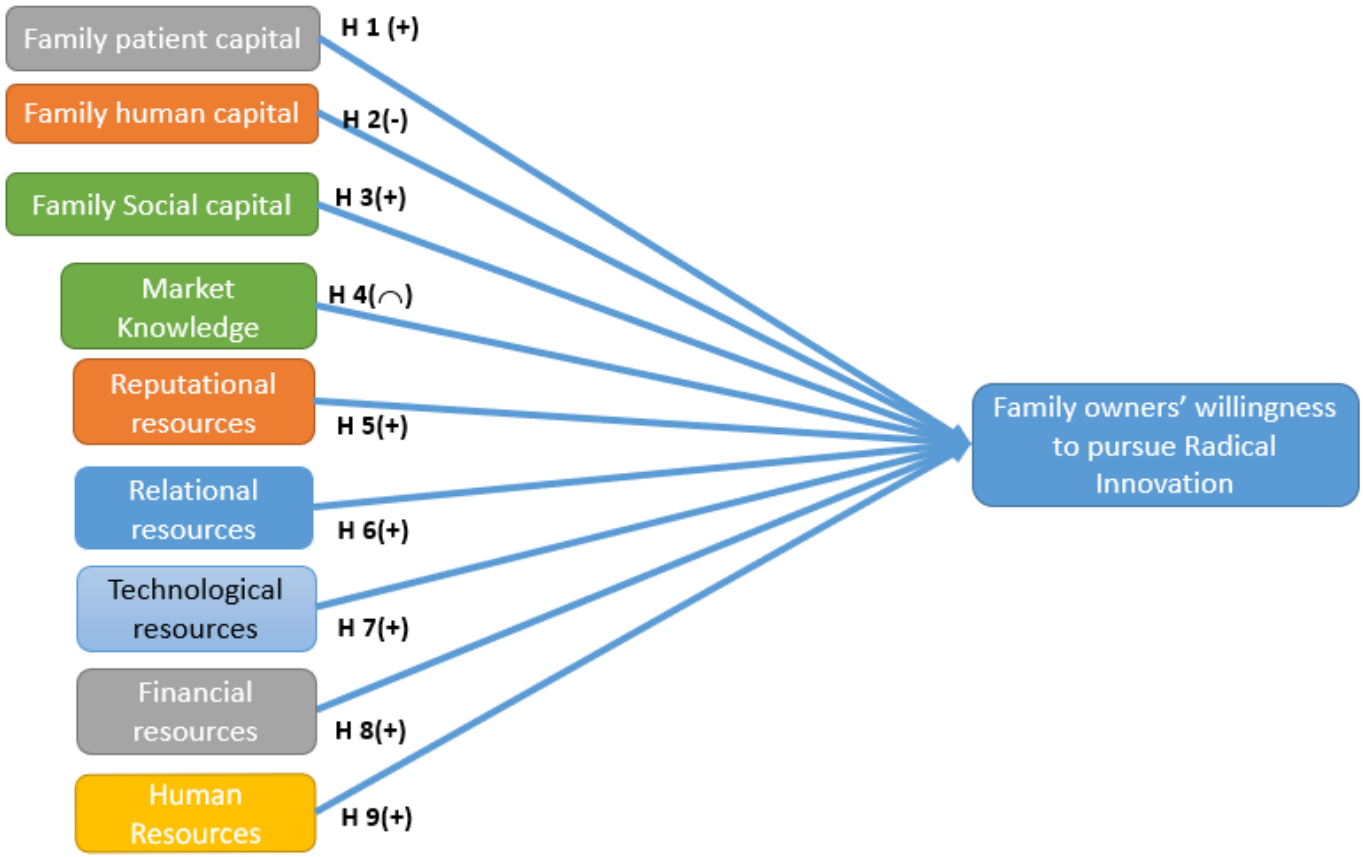
Second, human resources are conceptualised as the skills, abilities and values of non-family employees, and external human contractors who are responsible for contracting employees for either permanent or temporary working purposes (Zuiker et al., 2003). That is, human resources are the non-family workforce. However, the term 'family human capital' focuses on the skills, knowledge, abilities and values of current family employees within the firms (Dane et al., 2009). Last but not least, family social capital is the resources existing in the relationships among family members (Chirico & Salvato, 2014); meanwhile, the relational resources are more concerned with the relationships with external customers and channel partners.

Apart from the contribution from family resources, marketing resources can impact on family owners' willingness to pursue specific strategic actions (Ocasio, 1997; Kyriakopoulos et al., 2016). For instance, relational resources are conceptualised as the strength of the external social connections between the firm and its customers and business partners (Srivastava et al., 1998). Relational resources are valuable for firms to acquire new technology and novel knowledge, which encourage firms to pursue radical innovation. Novel knowledge (e.g. data sharing and new information) can be pooled from business partnerships during cooperation, and from customers' knowledge after using specific products and services provided by a firm (Covin et al., 2016; Gemunden et al., 1992). The firm can collect together these various data and experiences, especially the complementary resources, and seek out which aspects of the products and services need to be urgently improved, and opportunities for creating new products (Covin et al., 2016). At the same time, customers can generate novel ideas based on their knowledge and experiences (Gemunden et al., 1992). On the other hand, relational

resources can constrain firms to pursue radical innovation when such innovation activities are prone to generate radical change that breaks up or breaks away from established social networks (Chua et al., 2017). In addition, in cases of radical innovation, the *existing* or *current* connections to the firm may be redundant (Hughes & Perrons, 2011). Within family firms, radical innovation activities might then be avoided because they may generate a negative impact on maintaining social partnerships, which is an important dimension within SEW (Gomez-Mejia et al., 2007). Family firms have also been shown to exhibit some reluctance to enter new relationships over and above depending existing ones (Wright et al., 2005; Scholes et al., 2015; Cesinger et al., 2016). The degree of relational resources held, in this case, potentially generates a positive or negative impact on family owners' willingness to pursue radical innovation.

Both family resources and marketing resources are identified as the firm resources that have the potential to steer family firms' willingness towards the pursuit of radical innovation (Srivastava et al., 1998; Morgan, 2012; Kyriakopoulos et al., 2016). The following sections will explore in-depth how these firm resources connect to the degree of family owners' willingness to pursue radical innovation in family firms (Figure 4).

FIGURE 4: CONCEPTUAL MODEL FOR MODEL 2



3.3.2 HYPOTHESES ON FAMILY FIRM RESOURCES AND THE DEGREE OF PURSUING RADICAL INNOVATION

3.3.2.1 FAMILY PATIENT CAPITAL AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Family patient capital is defined as the financial resources accumulated from internal financing activities offered by only family members aiming to receive benefits (economic or non-economic benefits) from long-term investments (Sirmon & Hitt, 2003; Chrisman & Patel, 2012). Compared to financial resources such as loans from the banks with a three- to five-year period of return enforcement mentioned above, patient capital can last longer (more than 5 years) (Hoffman et al., 2006; Deeg & Hardies, 2016). Family patient capital is raised through internal financing activities among family members for two particular reasons (Sirmon & Hitt, 2003). First, the external debt market can have access to the family equity that tends to dilute family ownership and control, which is one of the most important dimensions of SEW concerning family members (Chrisman & Patel., 2012; Miller et al., 2015; Chua et al., 2017). To maintain SEW endowment, family owners could largely avoid acquiring external financial support to prevent sharing equity with other firms and financial institutions (Miller et al., 2015). Second, the patient loans provided by banks have restrictions and barriers to private firms according to the assets of the firm (Girma et al., 2008; Deeg & Hardie, 2016). The larger the assets held by family firms, the higher the chance they can raise patient loans from the bank (Girma et al., 2008). For small and young family firms, it would be difficult to raise such loans because the assets held by these firms are less likely to reach the standard offered by the banks (Deeg & Hardie, 2016).

On the negative side, family patient capital is limited towards the pursuit of radical innovation as it mainly or solely comes from family members in small and young family firms (Sirmon & Hitt, 2003; Konig et al., 2013). As radical innovation allows family firms to continuously inject financial resources, the limited amount of patient capital will narrow down the range of radical innovation options which are available for family firms to pursue (Bicen & Johnson, 2015).

On the positive side, these resources have large freedom to support the pursuit of radical innovation. Family members can have the discretion to allocate these resources towards risk-taking to fulfil the family-centred goals and values regarding accumulating wealth for the next-generation leaders (Miller et al., 2015). Specifically, family patient capital has no specified date of return for a long-term investment, which could increase family firms' risk tolerance level (Sirmon & Hitt, 2003). Additionally, the purpose of family patient capital is to

receive benefits from the long-term perspective (Hoffman et al., 2006). The increase of the patient capital could shape family decision makers' investment horizon (Sirmon & Hitt, 2003), which could gradually enhance family owners' willingness to pursue radical innovation.

In summary, the relationship between patient capital and the family owners' willingness to pursue radical innovation would be positively related. That is, increasing patient capital is positively related to the increasing degree of willingness to pursue radical innovation.

H1: THERE IS A POSITIVE RELATIONSHIP BETWEEN FAMILY PATIENT CAPITAL AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.3.2.2 FAMILY HUMAN CAPITAL AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

The general definition of family human capital entails the knowledge, skills, and ability held by family employees can contribute to the current firms in strategic effectiveness and efficiency (Coleman, 1988; Hsiao et al., 1997; Danes et al., 2009). The family human capital within family firms can generate advantages while family firms are pursuing radical innovation. Firstly, family firms have a high-level of job tenure which would support risk-taking behaviours (Zahra, 2005; Le Breton-Miller et al., 2015). During the development of firms, both founders and their subordinates are equipped with tacit knowledge encompassing vast of experience and knowledge in business operation, investment and innovative venturing (McConaughy et al., 1998; Zahra, 2005). Such tacit knowledge has created an effective context for family firms conducting oriented strategic implementation (Zahra, 2005). Kammerlander and Ganter (2015) suggested that family firms implement radical innovation strategies quickly once they have decided what to pursue. Family firms can be more easily persuaded to pursue radical innovation (Zahra, 2005; Kammerland & Ganter, 2015).

Secondly, family firms have apprenticeship systems to foster the next generation of leaders (Miller et al., 2015). Family founders provide on-the-job training (e.g. junior management interns) for next-generation leaders at an early stage in their careers (Learning from relatives and other non-family employees) (Jansen et al., 2005; Cruz & Nordqvist, 2012). Training could start from the current family firms and then move to partners' firms (Miller et al., 2015). In this circumstance, the next leader of a family organisation cannot only have deep tacit knowledge of their own firms but also have the potential to extend their capabilities by assimilating their knowledge acquired from other partners' firms (Zahra, 2012; Miller et al., 2015). Zahra (2005) found that a large number of generations involved in a family firm can

bring fresh insights from different aspects that would stimulate a strong degree of family owners' willingness to pursue radical innovation (Strikes et al., 2015).

Thirdly, since family members have shared language, values and goals, it could create highly cohesive daily operations regarding intensive and effective communication in family firms, particularly as family members would be expected to be the main workforce. Such a communication style can encourage mutual sharing of information, and facilitate its flow (Craig & Dibrell, 2006; De Massis et al., 2015). Employees can better understand the current radical innovation strategies, have a better feeling of trust with each other, and then create stronger synergy towards the innovation strategies (Hsiao et al., 1997; Mom et al., 2007; Cesinger et al., 2016).

However, the effectiveness of pursuing innovation activities will only exist at an early age. In fact, the separation of an 'outsider' (non-family employee) and an 'insider' (family member) mindset is rooted in many family firms (especially during first and second generations) (Zahra, 2012). Normally, founders would favour the development of their children, take extra care with other family members, and eventually undermine the non-family employees (Chua et al., 1999; Sirmon & Hitt, 2003; Cassia et al., 2011; Konig et al., 2013; Miller et al., 2015; De Massis et al., 2015). Through the unequal treatment, family firms cannot retain the non-family talent (especially those who hold contradictory opinions to those of their owners) and, at the same time, have entrenched family members' management power and latitudes over organisational rules (Zahra, 2012). If family owners concentrated on fostering the ability and skills of family members, the situation of strategic decision making relying on family members would be strengthened (Chirico & Salvato, 2014). In the meantime, as family human capital increases, family firms will be lacking in the diversification of professional knowledge and skills support and will enhance the degree of nepotistic appointments which have the extent to increase free-riders (Carney, 2005). Over time, family firms will witness 'strategic simplicity' (highly routinized operational processes) (Cohen & Levinthal, 1990; Miller, 1993; Zahra, 2005; Zahra, 2012) that are difficult for professional growth and then decrease the degree of family owners' willingness to pursue radical innovation.

H2: THE FAMILY HUMAN CAPITAL IS NEGATIVELY ASSOCIATED WITH THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.3.2.3 FAMILY SOCIAL CAPITAL AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Family social capital is conceptualised as the relationships among family members (Hoffman et al., 2006). It is a moral source that contains a level of trust, reciprocity and interactions

between family members (Nahapiet & Ghoshal, 1998; Hoffman et al., 2006). The deeper trust and the more interactions there are among family members, the stronger the family social capital will be, and in turn, the more value can be generated from the social capital (Chirico & Salvato, 2014).

There are differences between social capital and family social capital. Social capital consists of both 'strong' and 'weak' ties, but family social capital is only composed of 'strong' ties which are more intense, stronger, and enduring relationships among family members (Hoffman et al., 2006). Although family social capital is barely extending, and also limited among family members, it can facilitate fast knowledge internalization and quick flowing of information which is favourable for family firms to pursue radical innovation (Arregle et al., 2007; Konig et al., 2013; Chirico & Salvato, 2014). Salvato et al. (2010) suggested that family members behave more entrepreneurially, especially in product diversification and new technology adoption. At the same time, family social capital is different from family human capital. Family social capital is group focused entailing relationships among family members; while family human capital is individually focused regarding skill, knowledge and ability of each family member.

Family social capital seems to have drawbacks while family firms are pursuing radical innovation (Pearson et al., 2008). It could also slow down family firms to pursue radical innovation when such social capital is very high. Family social capital is formed by the connections among family members and accumulated by family involvement. When family social capital is high, family members will have a strong tendency to set norms, reciprocity and obligations and emphasise supporting each other with information (Hoffman et al., 2006). Family firms might then establish boundaries and gradually behave as less open and restricted to accepting new knowledge (Suddaby, 2010).

However, family social capital is conducive for family firms pursuing radical innovation. First, family members share the same background and have strong and similar tacit knowledge regarding their firms. It creates close interactions among family members and facilitates a higher level of opportunity recognition, knowledge assimilation and quicker value transformation (Cohen & Levinthal, 1990; Rothaermel & Hess, 2007). Second, during the year's operations, family firms have formed norms containing the common meaning of languages and behaviours that allow family members to easily understand the delivered information and knowledge (Nahapiet & Ghoshal, 1998). Third, strong shared values among family members have established a context of mutual trust and respect, and ideas are shared (Arregle et al., 2007). This can lead to decision-making effectiveness and faster convergence of individual goals to collective goals without ignoring a single idea from a

single individual (Hoffman et al., 2006). Family firms then have a strong ability to capture opportunities within the business environment by connecting individual goals with external opportunities.

Through the lens of the attention-based view, family social capital will increase confidence while family firms are planning to pursue radical innovation. Not only do family members have deep tacit knowledge which allows them to better connect opportunities with the firms and then better predict the future, but also family members are highly committed to the plan (Salvato et al., 2010; Konig et al., 2013). With strong family social capital, it can raise the common trust of the pursuit of radical innovation among family members and, at the same time, raise the degree of family owners' belief in pursuing the innovation activities.

H3: THERE IS A POSITIVE RELATIONSHIP BETWEEN FAMILY SOCIAL CAPITAL AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.3.2.4 MARKET KNOWLEDGE AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Market knowledge resources are conceptualised as the knowledge and experience held by firms that help to create an overview of the current business market (Kyriakopoulos et al. 2016). It includes the knowledge of competitors and their business activities (such as pricing, advertising, product development and market planning), and information on channel partners and customers (Morgan, 2012; Kyriakopoulos et al., 2016). The knowledge and experience are accumulated from past market activities (e.g. segmenting, targeting and introducing new products and services).

Marketing knowledge is crucial to steering family owners' attention towards radical innovation. In particular, it creates a stock of information for firms to track market change and record the needs of customers at different times (Jaworski & Kohli, 1993; Morgan, 2012). Over time, as the tracking and recording keep accumulating, firms can predict the next market change to some extent and take relevant, innovative actions (e.g. radical innovation) (Srivastava et al., 1998; Reid & Brentani, 2012). Meanwhile, the experience is accumulated after every time of launching new products. Apart from the experience of commercialising new products, the family firms are more experienced to accept expected failures for the current and following innovation activities (Jaworski & Kohli, 1993). The increasing of tracking records of the market change and experience of projecting, planning and commercialising innovation can enlarge the degree of family owners' willingness and shape family owner-managers' decisions towards the pursuit of radical innovation.

Theoretically, market knowledge resources could increase family firms' confidence to pursue radical innovation (Jaworski & Kohli, 1993; Srivastava et al., 1998; Reid & Brentani, 2012). However, many old family businesses, such as shoemaking, wine makers and breweries, have stayed in the same market for generations (Le Mens et al., 2015). Although these family firms have gathered rich market knowledge, they still generate low radical innovation (Miller et al., 2015). The strong market knowledge would routinize and make rigid family owners' behaviour, and ground their attention myopically on existing products (Kyriakopoulos et al., 2016). In such a context, family owners can have low willingness towards the pursuit of radical innovation even though they have strong market knowledge and experience to draw upon. Hence, when market knowledge has accumulated to a certain level, it is prone to decrease family owners' attention towards pursuing radical innovation.

H4: THE MARKET KNOWLEDGE RESOURCES HAVE AN INVERTED U-SHAPED ASSOCIATION WITH THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION, IN WHICH THE INTERMEDIATE LEVEL OF MARKET KNOWLEDGE CAN GENERATE THE HIGHEST DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.3.2.5 REPUTATIONAL RESOURCE AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Reputational resources are conceptualised as the strength of the image recognition within a market (Morgan, 2012). The creation of the image comes from two areas of influence: brand image of the firms (Morgan, 2012). The brand image is the mental picture perceived by customers (Aaker, 1991). It includes the symbol and meaning that the firm uses to catch the attention of people and associate their awareness with specific products and services offered by the firm (Weitz & Sharma, 1998). For instance, when products and services have created an experience that is higher than the customers' expectations, it starts to build up the image in customers' minds by linking products and services with the brand names (Oliver, 1991; Gil et al., 2007). The experience can motivate the customers to search for deeper information such as firms' names, history and events (Zeithaml, 1988).

In the long-term, the accumulated positive experience of purchasing the same products and services will be entrenched in the memory of customers (Morgan, 2012). Such memory has impact on the customers' purchase decisions: first, they will immediately recall a specific brand associated with certain products and services when they see the brand symbol or hear the name of the company; second, they will primarily think of buying products under a specific brand and stop searching for replacements (Zeithaml, 1988). The wider brand influence, the stronger reputational resources held by firms.

The corporate image is viewed as the image perceived by people in the business market (Fombrun & Shanley, 1990). It is built up when firms launch products and services and then receive positive responses from the market. Over time, firms establish the image which will generate a positive impact for the firms on audiences' minds (Brown & Dacin, 1997).

The concepts of brand and corporate images overlap regarding providing favourable products and services to the market and, in turn, associate these products and services with names of the firms (Morgan, 2012). However, differences also exist between the two (Cretu & Brodie, 2007). The brand image tends to produce symbolic connections with specific products and services in customers' minds. In particular, the brand image influences their decisions on their next purchase of specific products which are similar with customers' expectations (Morgan et al., 2006; Aaker, 1991). However, different customers might have different experiences of purchasing specific products; brands will guide customers to purchase similar products when they need to (Cretu & Brodie, 2005).

The influence generated by the corporate image, on the other hand, is wider than the brand image. Corporate image is the degree of recognition regarding how firms are perceived by audiences (i.e. consumers, competitors and potential channel partners) (Morgan, 2012). Marketing related activities with constant firm performance will become more entrenched in audiences' minds and enhance their interests in following launching new products. Through this way, firms can keep engaging these audiences with forthcoming radical innovation activities (Brown & Dacin, 1997). In this case, the corporate image will accelerate customer acquisition and increase the chance of business corporations, and in turn enhance financial gain (Aaker, 1991). While launching new products, firms will receive a more positive evaluation from audiences (Morgan, 2012).

The stronger the reputation held by firms, the more potential customers the firms will receive. As the customers are willing to buy the new products, it can decrease the potential losses from launching new products and services. In the family firm context, many family firms passed through generations (e.g. Clarks, Grenson and Leon Paul). They have a strong stock of reputational resources associated with their industries, which can generate deeper and wider influence on existing and potential customers.

Other than that, a favourable market reputation can also attract firms from other industries and together they can plan for new possibilities (Adelman, 1993; Money et al., 2010). First, it would be leverage for potential partners which have a weak reputation within a market. Such partners will rely on firms which have a high reputation in order to receive a better market response after launching their products and services (MacMillan et al., 2005). Family firms, especially old ones, holding strong reputational resources can attract new partners,

generating business collaborations. For instance, the Danish fashion designer Le Fix shown the interests in launching new trainers with Clarks (one of the most famous shoemaking family firms in the UK) (Pearson, 2016); The renowned skate brand SUPREME worked with Clarks and then launched a new Wallabee boot (Cowen, 2016). The American fashion brand OVO engaged in a similar collaboration with Clarks, generating a new version Desert Boot (Woolf, 2017). Family firms can accumulate innovation experience from these collaborations, which will extend their investment horizon towards radical innovation (Chrisman & Patel, 2012). Thus, reputational resources will enhance the radical innovation thinking within family firms.

In the family firm context, reputational resources include family norms and values which are viewed as significant SEW dimensions (Binz et al., 2011). Theoretically, family firms will avoid pursuing radical innovation when family firms' reputation is strong (Berrone et al., 2010). As radical innovation tends to generate big differences and displace the current products, it is difficult to direct audiences' attention to accept new products in a short period (Kyriakopoulos et al., 2016). Radical innovation, in this case, will dilute the family firm's reputation and have the potential to cause the loss of current audiences (Hannan & Freeman, 1984; Binz et al., 2011). However, according to Le Mens et al. (2015), innovation will render the loss of current audiences but, at the same time, will attract new audiences to fill the gap of the losses of current audiences. Reputational resources will be maintained when the coming radical innovation has great potential.

In addition, family firms are willing to pursue radical innovation when the innovation can assist firms to achieve centred family goals (De Massis et al., 2014; Miller et al., 2015; Kammerlander & Ganter, 2015). Strong reputational resources will generate potential business cooperation; family firms will have a higher chance to select potential partners who have similar goals and are able to provide complementary resources for the radical innovation with which they both work (Dyer & Singh, 1998). Thus, reputational resources are positively associated with the degree of family owners' willingness to pursue radical innovation.

H5: THERE IS A POSITIVE RELATIONSHIP BETWEEN REPUTATIONAL RESOURCES AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.3.2.6 RELATIONAL RESOURCES AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Relational resources are a reflection of external social capital, including the strength, duration, and exchange value between firms and social entities (e.g. suppliers, customers

and channel partners) (Srivastava et al., 1998; Morgan, 2012; Kyriakopoulos et al., 2016). Morgan (2012) suggested every social entity can add specific market value while firms are pursuing radical innovation. For instance, customers (a social entity) can provide feedback for firms regarding product and service improvement based on their current knowledge (Wirtz et al., 2010; Covin et al., 2016), while channel partners, especially the close ones, will provide access to market information (Morgan, 2012). In this case, firms can improve selling activities, such as pre-selling by initial contacting customers that can help observe the the potential value of new products before mass production (Freel, 2003; Morgan, 2012). On the other hand, the close relationship between firms and suppliers can generate strong intention in exposing novel knowledge and integrating state-of-the-art technologies with the existing products and services (Hughes & Perrons, 2011). Taken together, relational resources can play an important role in directing firms' attention towards searching for new information.

Family firms have paid greater attention to maintaining relational resources as one of the life-long strategies (Sirmon & Hitt, 2003; Zahra, 2010; Konig et al., 2013; De Massis et al., 2016). Compared to the non-family firms' context mentioned above, family firms have a closer and stronger relationship with customers and channel partners (Carney, 2005; Chirico & Salvato, 2014). This implies that family firms have innovation advantages by relying on these close relationships. First, close partnerships reflect the high degree of trust between family firms and their partners. Such partnerships can provide access to partners' knowledge, sharing sensitive information (e.g. customer information, and information of launching new products) with each other (Grant, 1996; Heide et al., 2007), specifically the information and resources which could generate resource complementation that can enhance family firms' resource stock and scope to sense and seize opportunities (De Massis et al., 2015). More importantly, partners can bear parts of potential losses together with family firms, which can reduce the family's attention putting on preventing the loss of wealth (Sirmon & Hitt, 2003; Chrisman & Patel, 2012; Chrisman et al., 2015). These benefits brought by strong relational resources can increase family owners' willingness towards risk-taking and then pursue radical innovation. We propose that the relational resources can drive family owners' attention on pursuing radical innovation.

Although the previous studies indicated there is a strong positive relationship between relational resources and family owners' willingness to pursue radical innovation (Jensen et al., 2005; Wirtz et al., 2010; Kyriakopoulos et al., 2016), the firms (non-family firms and family firms) would acquire little innovative benefit from relational resources when the stock of relational resources became static. The static stock of relational resources will not bring constant fresh insights for family firms for radical innovation purposes (Money et al., 2010). First, as the general process of organisational inertia, firms are more and more formalised in

terms of narrowing down opportunistic behaviour and becoming myopic to an existing product or service development (Hannan & Freeman, 1978). It would also be difficult in that channel partners would constantly search for novel business cooperation while they are increasingly inert (Le Mens et al., 2015). Both family firms and their channel members will follow the same rules of inertia and gradually create the static schemata of the existing business activities, and then reduce the family owners' willingness of searching for novelties (Hannan & Freeman, 1982; Gretzinger & Royer, 2011). Second, radical innovation cannot purely rely on the ideas of customers. Radical innovation aims to generate new products and services which are way beyond the products within current industries (Veyer, 1998; Konig et al., 2013). The initial pictures of the future products and services are fuzzy in customers' minds and are not helpful for family firms to target (Gil et al., 2007; Morgan, 2012; Kyriakopoulos et al., 2016). The family owners' willingness to pursue radical innovations driven by relational resources are motivated in a diminished way.

H6: THERE IS A POSITIVE RELATIONSHIP BETWEEN RELATIONAL RESOURCES AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.3.2.7 TECHNOLOGICAL RESOURCES AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Technological resources are defined as patent, technological, and scientific knowledge owned by firms (Morgan et al., 2006; Kyriakopoulos et al., 2016; Kim et al., 2016). Technological resources are unique and are accumulated through routines of current product development, refined R&D procedures, past innovation practices, and the buyout of licenses and patents from the external environment (Han et al., 2001; Kim et al., 2016). They also include manufacturing facilities and production techniques which attempt to raise productivity (e.g. economics of scale) (Han et al., 2001).

During development, firms keep pooling and selecting resources which have the potential for firms to fit the environment and, at the same time, match the organizational format in order to gain competitive advantage (Hambrick & Finkelstein, 1987; Porter, 1996). The increase in holding scientific knowledge and skills can speed up the connections between sensing opportunities and provide relative innovative actions (Calantone et al., 2003; Cohen & Levinthal, 1990). In family firms, the period between sensing and making innovation decisions is even shorter because family firms have stronger discretion in strategic implementation (Konig et al., 2013). Knowledge and skills can increase the family members' scope of sensing opportunities and can prevent them from recycling knowledge (Kim et al., 2016). Family firms have abilities to select a wider range of radical innovation possibilities.

Thus, technological resources are crucial for extending firms' innovation abilities (Cohen & Levinthal, 1990).

Through the lens of the attention-based view, technological resources play an important role in steering family members' attention towards pursuing radical innovation. First, technological resources, such as patents, are accumulated from every successful innovation. Successful innovations have provided positive experiences which can increase the willingness of family owners to pursue the next innovation (Chrisman & Patel, 2012). Meanwhile, technological resources can add technological value on projecting new products and have a large extent to decrease the risk of imitation by rivals (Kim et al., 2015).

Second, technological resources can help to monitor the changing of the business environment and provide historical data to track past innovation activities. Family firms can better predict the future and pursue radical innovation by referring to patents. Technological resources, in this case, not only add the experience of conducting innovation activities but also ease family members' attention on preserving the current economic and non-economic wealth. At the same time, technological resources raised family members' tolerance in accepted failure and increased family owners' willingness to look forward and pursue radical innovation. We proposed that technological resources can positively relate to the degree of family owners' willingness to pursue radical innovation.

H7: TECHNOLOGICAL RESOURCES ARE POSITIVELY RELATED TO THE FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.3.2.8 FINANCIAL RESOURCES AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Financial resources are defined as the ability to access external cash and capital from banks and other financial entities that can be invested in venture strategic actions (Morgan et al., 2006). The ability to raise external financial resources is crucial to support payment delays, to invest in capacity expansion and new product development, to offer cushioning for the daily operation after a big wave of venture investment (Peng, 2009; Hsu & Fan., 2010). Hence, apart from the venture investment over-reliance on patient capital, accessing external financial resources would provide more financing channels for family firms to pursue radical innovation possibilities.

Because firms have different levels of access to external financing resources (Mintzberg, 1987), the ability to access external financing is unique to a firm and tends to generate different advantages towards the pursuit of radical innovation (Barney, 1991). For instance,

some family firms have a higher chance to access bank loans (e.g. normal bank loans and patient bank loans), or issue bonds (debts) (Huang & Song, 2006). Some family firms such as small and young family firms, however, might have difficulties in accessing external financing resources because external institutions have set restrictions for shortening the liquidation (Deeg & Hardies, 2016). Family firms will have a higher chance of conducting radical innovation successfully supported by various financing channels.

However, external financial resources are not identified as the main financial resources while family firms are pursuing radical innovation. Heavy reliance on external financial resources will cause the sharing of ownership and control with external financial institutions (Sirmon & Hitt, 2003; Carney, 2005; Gomez-Mejia et al., 2007). The access to external financial resources, in this case, plays an assisting role in the pursuit of radical innovation in family firms. When family firms cannot catch up with certain radical innovation because of the lack of funds, external financial resources can boost the firms' financial ability and make innovation happen.

Many family firms attempt to engage in innovation activities by heavy reliance on family patient capital (Bicen & Johnson, 2015). But it could be limited when radical innovation allows big financial investment which exceeds the original budget coming from the family patient capital. External financing resources are possible to inject into the coming innovation and further enhance family owners' willingness to continue. In addition, because family owners are afraid to witness the loss of SEW endowment (Berrone et al., 2010), they are likely to pursue innovation strategies which contain a high degree of certain and predictable results (Covin et al., 2016). Family firms will lose a number of chances to adopt innovation if family firms are highly committed to patient capital. External financial resources can steer family owners' attention towards opportunistic investments and will decrease the degree of risk of being lost SEW endowment. Thus, the stronger the abilities to access external financial resources, the greater the degree of family owners' willingness to pursue radical innovation.

H8: THERE IS A POSITIVE RELATIONSHIP BETWEEN FINANCIAL RESOURCES (ABILITY TO ACCESS EXTERNAL FINANCING) AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.3.2.9 HUMAN RESOURCES AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Human resources, in our study, are conceptualised as the knowledge, experience and skills of non-family employees (Cavusgi & Zou, 1994). Family firms prefer to foster, promote and

empower family members in order to increase family control and pass the firms through the generations (Berrone et al., 2010). To do this, however, family firms have largely undermined the ability of non-family employees and in turn decrease the employees' commitment. Family firms have created a sense of a slim career future for non-family employees, and are less likely to retain family employees for a long period (Le Breton-Miller & Miller, 2006). At the same time, the preferences of promoting family employees has a large chance to enhance nepotistic appointments and free riders (Miller et al., 2015). The enhanced rate of non-family employees' turnover and family free riders can cost family firms a great deal (Anderson & Reeb, 2004). Limited non-family talent and financial resources will steer family owners' attention away from pursuing radical innovation.

Non-family employees are important for family firms pursuing radical innovation, especially when family firms have developed to a certain degree. First, non-family employees, especially non-family professionals, can view the family firms in an objective way and bring in critical information which might be overlooked by the firms (Anderson & Reeb, 2004). That information can establish connections between family firms and the external environment, which will improve family owners' thinking and scope to catch up with wider business opportunities (Miller & Le Breton-Miller, 2006).

Second, compared to family employees who grew up and trained within family firms, non-family employees can bring fresh insights from the external business environment into current family firms and diversify family owners' thinking while they are making a strategic decision (Vallejo, 2009). Family firms can generate more innovation actions through family members' efforts at the beginning of the organisational life cycle (Matzler et al., 2015). One of the reasons lies in the fact that family members have deep tacit knowledge of firms that can quickly connect new ideas with strategic actions (Zahra, 2005). But family members' minds will be highly entrenched during firms' development and not jumping out of the box while pursuing the next radical innovation is necessary. Non-family employees might have rich work experiences from different industries. This work experience adds ideas while family firms are pursuing radical innovation. Besides, non-family employees would like to work in family firms because the former have unclear boundaries across departments (Moscetello, 1990). Non-family employees are motivated by wider job latitudes and become more involved in radical innovation activity.

Although the increasing involvement of non-family employees might cause family firms to lose control and SEW endowment (Sirmon & Hitt., 2003), however, according to Vallejo (2009), 'the involvement level of non-family employees positively and significantly influences the survival or continuity of family-owned businesses'. As continuity and survival are

important dimensions in SEW, the increasing involvement of non-family employees actually makes a contribution to maintaining SEW endowment. Hence, family firms have the potential to hiring non-family talents for pursuing radical innovation. In summary, the skills, knowledge, the motivation of non-family employees can drive family owners' attention towards the pursuit of radical innovation.

H9: THERE IS A POSITIVE RELATIONSHIP BETWEEN HUMAN RESOURCES (NON-FAMILY) AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION.

3.4 CONCLUSION

This chapter selected two research gaps from Chapter 2, which were further specified into two research questions. Question one is related to family owners' fear of losing SEW dimensions and firm innovativeness, and question two is associated with family firm resources and family owners' willingness to pursue radical innovation. Two theoretical lenses (negative emotion and problem-solving theory, and the attention-based view) were selected to support the research questions. In addition, hypotheses were created based on these two theoretical lenses preparing to respond to the two research questions.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter will detail and discuss the research methods selected to examine Research Model 1 and Research Model 2. It will discuss and justify the selection of specific research methods and the ontological and epistemological considerations that guide those choices. This chapter will be organised as follows. In Section 4.2, the research design will be explained following the structure of ontology and epistemology, the positivist view and quantitative research methods. Section 4.3 will introduce the selection of the sample and data collection procedures, following Section 4.4 (data collection procedures), 4.5 (variable measures), and 4.6 (data analysis procedure and strategy). Section 4.7 will conclude this chapter.

4.2 RESEARCH DESIGN

The section will first discuss the ontological and epistemological assumptions underpinning the methodology chosen in the current study, under the structure of an overview of realism and constructionism principles, and empiricism and interpretivism philosophical stances. The section detailing the quantitative methodology will follow this section detailing the nature of philosophy. This section overall will build the logical connections between research philosophy, quantitative research methods, and empirical data collection in order to support the two research projects within this study.

4.2.1 ONTOLOGY

The assumptions from ontology and epistemology can shape how researchers understand their research question, selection of a method, and interpretation of findings (Saunders et al., 2016). Thus, philosophy in social world research is to underpin the methodology choice, research strategy, data collection and procedures of analysing data, which will have a strong impact on generating knowledge.

Ontology informs the methodology by defining the ‘nature of reality’ and the existence of objects in the social world (Garshol, 2004). There are two extreme assumptions within ontological thinking, realism and constructionism (Sarantakos, 2005). Realism entails the objects within the social world existing independently from experience and perceptions of individuals (Saunders et al., 2016). The theory and belief embedded in people’s minds, therefore, are widely shared in a society that everyone has the same understanding of an object (Tuli, 2010). On the other hand, constructionism suggests that the social world is understood by subjective interpretation (Sarantakos, 2005). In the constructionist view, individuals are different from each other regarding the living environment, cultures, languages, and educational backgrounds such that the understanding of social actions and

phenomena should be dependent on the meanings which are generated from the interactions between individuals and the environment in which they live (May, 2001).

4.2.2 EPISTEMOLOGY

Epistemology concerns ‘how people know about the world’ informing the methodology towards the nature of knowledge that consists in ‘what the facts are’ and ‘where the knowledge comes from’ (Sarantakos, 2005). Researchers should demonstrate the assumption of knowledge in order to communicate knowledge to others (Tuli, 2010). In the business and management world, there are different types of knowledge generation tools regarding numerical data, visual data, narratives, and even stories (Saunders et al., 2016). Therefore, the epistemology guided by ontological thinking can provide various method possibilities for researchers.

Two extreme epistemological positions are generally put forward in the social research field: empiricism and interpretivism (Bryman, 2008). Ontology assumptions are the starting points guiding the logic of epistemology stances (Sarantakos, 2005). For instance, realism embraces the objectivism that the existence of social entities is a universal law within a society shared by most of people. The social entities are noticed as physical entities, which exist independently of how people label them and are aware of them (Saunders et al., 2016). Thus, the knowledge from this assumption then can be proofed and verified by sharing experiences and observations of a large group of individuals (Bryman, 2008). This concept induces empiricism that the existence of the knowledge can be discovered, measured, and experimented with through (large) numbers of observations conducted by researchers (Sarantakos, 2005). Similar to natural science, it then guides researchers to acquire knowledge from massive data experiments (Neuman, 2011).

Constructionism embraces subjectivism in which objective truth and objective reality do not exist in human society. The social world is constructed by people who live in it, and the reality exists within the experience and meaning generated from the interaction between people and the environment (Sarantakos, 2005). For instance, the social world that researchers try to interpret is based on the meaning which could be combined with historical, geographical, and socio-cultural contexts (Saunders et al., 2016). Under this assumption, researchers hold the interpretive thinking and subjectively believe there are different social realities which reflect the value of different individuals. Hence, constructionism leads researchers towards interpretivism that knowledge exists in people’s inner mental states (Saunders et al., 2016). The knowledge under this ontological and epistemological

assumption will be generated from the different meanings and researchers' subjective interpretation.

4.2.3 THEORETICAL PERSPECTIVE

Two major theoretical perspectives are informed by epistemology, positivism and interpretivism. Positivist research is developed based on the belief that existing knowledge can be acquired through independent observation (Guba & Lincoln, 1994). The logic of such a type of research is to view the cause and effect of universal occurring regulations of events in order to generate the isolation of universal laws. Therefore, realities do not exist in meanings perceived by positivists but exist in a large number of observations (Crotty, 1998). In addition, these observations are measurable and can help predict behaviour and events within an organisation (Saunders et al., 2016).

Positivists use existing theories from previous research projects to establish hypotheses that can be tested by relying on a large data set. On the one hand, these hypotheses confirmed within a project can be referred to or be tested in future research projects; on the other hand, a dataset could be collected by respondents completing surveys created by researchers (Cortty, 1998). However, Saunders et al. (2016) argued that positivists could not keep a social research project purely objective in which the ways of selecting respondents is based on the subjective focus of researchers. To overcome such a limitation, it is vital to keep a research project as objective as possible to maintain the rigors of data collection procedures and the consistency of survey questions, and then acquire 'true' responses from respondents (this will be explained in detail in the following sections) (Saunders et al., 2016: 137).

Positivism is an appropriate philosophical stance to acquire knowledge when researchers view human behaviours as being caused by objective factors (Bryman, 2008). These causations between human behaviours and factors can be created by making sense of the social world (Saunders et al., 2016).

On the other hand, interpretivism concerns the meanings which are generated from different individuals. Instead of generating universal 'law' which would ease the complexity of the social world, interpretivists are more critical in searching for rich insights (Saunders et al., 2016). The interpretivists' idea is to create new, and richer understandings of the social world by collecting data such as texts, symbols, stories, and images in a social world. The knowledge then emerges through the subjective interpretation of these subjective data by researchers. Therefore, the research projects developed by researchers are to explore factors which can cause the changing of human behaviours (Saunders et al., 2016).

4.2.4 METHODOLOGICAL CHOICE

Based on the philosophical assumptions guided by ontology and epistemology towards the nature of reality and the nature of knowledge, the methodology can be selected that is either quantitative research or qualitative research (Sarankakos, 2005).

The nature of quantitative research is underpinned by the realist ontological assumption, the empiricist epistemological stance, and the positivist theoretical perspective regarding the research contains objective belief of the social world's existence, generating universal 'law' and will be supported by highly structured data collection techniques (Saunders et al., 2016). Quantitative research is related to a deductive approach (testing theory) focusing on the development of the theory in an explanatory manner. Thus, the general procedures of the theoretical development are: (1) establishing hypotheses or other testable propositions between variables, (2) pre-examining the hypotheses or propositions by logically bridging findings from previous studies under a specific theory or a theoretical category, (3) collecting data to measure the concepts to support hypotheses, and then (4) acquiring results from the data to either accept the hypotheses or propositions when results are consistent with the premises, or reject the hypotheses or propositions when the results are not consistent with the premises (Saunders et al., 2016).

Generally, quantitative research design relies on a survey to collect data. Because the survey design and questions are highly standardised, researchers should take into consideration of receiving an effective amount of responses (n=50+8m, n represents the effective responses, and m denotes the number of independent variables within a research project) in order to ensure the validity of knowledge and generalisability (Pallant et al., 2013).

On the other hand, the nature of qualitative research is supported by the constructionist ontological assumption and guided by the interpretivist epistemological stance, then connected with the interpretivist theoretical perspective (Bryman, 2006). Qualitative research is an inductive approach to develop new theory, through identifying research interests by observations, collecting data through interview and then formulating a theory based on the interview text, narratives and stories, and symbols (Saunders et al., 2016). Researchers who adopt qualitative research can explore rich meaning from the qualitative data mentioned above. To acquire qualitative data, the communication skills held by researchers become important in allowing them to explore the meaning between the lines (Sarankakos, 2005). Communication skills such as encouraging interviewees to provide information and guiding them towards the research topic can increase the value of the qualitative data (Saunders et al., 2016).

4.2.5 PHILOSOPHICAL AND METHODOLOGICAL CHOICE FOR THE CURRENT STUDY

Between 2003 and 2016, family firm radical innovation studies have witnessed a dramatic growth in theoretical diversification in RBV, agency theory, behaviour agency theory, and ability and willingness theory under the umbrella of governance. Such growth has created a wide range of findings originating from a different set of assumptions which makes the accumulation of knowledge unclear. It is necessary to reconcile the current understanding of family firm innovation to demonstrate useful implications which can be widely generalised to real-world practice.

In order to generalise the universal 'laws', the belief of current study is driven by realist ontological thinking and an empiricist epistemological philosophical stance, concerned with testing relationships between fear of losing endowment in certain SEW dimensions and family firm innovativeness (Research model 1) and between family firm resources and family owners' willingness to pursue radical innovation (Research model 2). In the current study, these four variables are viewed as objective factors existing in the social world, and have cause and effects among them underpinned by theories from family firm and non-family firm innovation studies (Sirmon & Hitt, 2003; Carney, 2005; Morgan et al., 2006; George & Zhou, 2007; Gomez-Mejia et al., 2007; De Massis et al., 2014; Kyriakopoulos et al., 2016; Filser et al., 2017).

The positivist stance further induced the selection of quantitative research method, employing survey as the main tool for data collection. The hypotheses were established based on the theoretical connections among firm resources (Morgan et al., 2006), family firm resources (Sirmon & Hitt, 2003), willingness of decision making (De Massis et al., 2014); and theoretical connections among negative emotions and managerial actions (George & Zhou, 2007), SEW dimensions (Berrone et al., 2012), and innovativeness (Sciascia et al., 2015; Fliser et al., 2017). The following sections will explain the sample, data collecting and questionnaire design in detail.

4.3 SAMPLE

'Family firm' is defined as a firm which is governed, managed and owned by members of the same family, and members of the same family (nuclear family and extended family), with the intention to operate through generations (Chua et al., 1999). Based on this definition, the family firm is a private firm owned by a family member or a group of family members and controlled by a family member or a group of members. Thus, the initial criterion of identifying family firms is to search for firms which are 'owned' by an individual or individuals. As the firm's ownership should be held by a family member or family members, in this circumstance,

there are two different combinations: (1) a private firm which is owned by an individual whose share is over 50%, and at the same time, the individual should have a spouse, sibling, partner, or children sharing part of the rest ownership or positioned in the top management team, or holding both shares and top management positions (Chua et al., 1999); (2) a private firm owned and controlled (positioning in the top management team) by one individual who has strong intention to continue the current business and plans to pass the firm to a spouse, sibling, partner, or children in the future; 3) a private firm owned and controlled by a family or families (e.g. nuclear family includes father, mother and children; also extended family members such as aunts, uncles, cousins and so on) in which the family owns over 50% of shares (the sum of the shares held by family members exceeds 50% of the total share) and has great power in decision-making over non-family employees (Chua et al., 1999). Any private firms which have matched one of the criteria mentioned above can be identified as family firms.

Our model requires a sample of a population of firms in which two characteristics must be present: (1) a sufficient number of family firms to enable robust investigation; (2) the relevance of innovation to those firms. In 1979, the enactment of the 'reform and opening up policy' ended the state monopolized trade in China, and created a link between trade (both domestic and international) and private business entities in mainland China (Wei, 1995). Since then, the Chinese market has witnessed a sharp increase in the number of private firms in manufacturing industries, from small family workshops (e.g. shoe-making, food processing and brewery) as the dominant businesses at the beginning of the 1980s, to small and medium-sized private manufacturers afterwards (Cheng & Feng, 1999). In 2012, 50% of GDP within the manufacturing industries was attributed to private firms (384,558 listed private firms (Orbis)); these private firms contained 85.4% of family firms in China (National Bureau of Statistics of the People's Republic of China, 2015).

However, during the dramatic emergence of private family firms, these manufacturing industries also demonstrated a high degree of motivation in engaging innovation to face this sizeable increase in the competitiveness of the business market (Wang et al., 2014). On the one hand, innovation is the way of keeping hold of resources (e.g. tacit knowledge) from 'invented around' by rival firms (Harabi, 1995); on the other hand, innovation also plays a vital role in assisting firms in probing market niches and then increasing the value acquisition from selling products and services within a market (Barney, 1991). According to the National Bureau of Statistics of the People's Republic of China (2015), R&D spending shows a 9% annual increase in manufacturing industries (containing both private and state-owned firms) from 2011 to 2012, and such spending accounted for 1.97% of GDP (OECD, 2012). Hence, Chinese manufacturing industries represent a favourable data collection context for family

firms and particularly for the investigation of their innovation activities, with a large family manufacturing population and a certain degree of innovation motivation.

Private manufacturing firms are mainly distributed on the east coast and southwest parts of China. Until 2016, there were 61158 and 20010 private manufacturing firms on the east coast (Shanghai, Jiangsu province and Zhejiang province) and in the southwest (Chongqing, Sichuan, Guizhou and Yunnan provinces) parts respectively (National Bureau of Statistics of China, 2017). Within these two areas, Chongqing has shown potential for family firms and innovation study. First, it contains 4242 private manufacturers (including over 80% family firms) and demonstrates significant R&D spending consisting of 23-billion-yuan (around 2.6 billion GBP) by firms which have 20 million yuan revenue annually (National Bureau of Statistics of China, 2017). Second, the number of private manufacturing firms and R&D ratio is larger than the rest of the cities in the east and southwest areas in China, with around 5.4 million yuan spending per firm in Chongqing. In addition, there was a 10% annual growth of the number of new private manufacturing SMEs between 2012 and 2015 (Chongqing Annual Report, 2015). Hence, Chongqing has provided a context for robust investigation towards family firms innovation.

Manufacturing SMEs are defined as the those firms having a total amount of full-time employees of less than 1000 (National Bureau of Statistics of the People's Republic of China, 2006). However, unlisted Chinese SMEs have the right to hide company information in operations (e.g. financial and operational data) (Li, 2004). Thus, it is difficult to access data and information before building up 'Guanxi' and connections with business contacts in China (Goodman, 1997; Park & Luo, 2001). Due to the limitation of reaching the overall manufacturing population, we will rely on the local Chamber of Commerce, a government agency, to enhance the response rate. The membership of the Chamber of Commerce formed our sampling population, of which the sampling frame consisted of those matching the criteria listed and discussed above. Through the efforts offered by Chamber of Commerce, we have reached our sample which contains 1412 owners, owner-managers representing people from top management team of 706 private manufacturing SMEs (two respondents per firm) located in Chongqing, China (the procedure of filtering 706 private manufacturers will be explained in detail in the next section).

At this point, however, it is imperative to explain a seldom-considered source of possible bias in empirical research: the sampling frame and sampling procedure itself (Murphy, 2002), and as much as it is necessary to assess the adequacy of a sampling frame, there must be *a priori* acknowledgement of sample limitations (Short et al., 2002). The construction of a sample can cause problems for representativeness and cause findings to be skewed or even

irrelevant (Murphy, 2002). Murphy (2002) suggests investigating one's own sampling process frames for biases to this end. For this study, carefully distilling the sampling criteria for family versus non-family firms, and selection procedures around the types of firm to ensure they were directly relevant to the themes of this study ensured the risk of possible bias and the sampling error was mitigated. At the conclusion of these actions, the researcher is confident of the representativeness, validity and applicability of this sample, and its adequacy for the purposes of this study.

4.4 DATA COLLECTION PROCEDURES

4.4.1 ONLINE SURVEYS

The data collection was conducted by using online surveys targeting Chinese family small and medium enterprises (SMEs) in manufacturing industries in mainland China. The online survey is a low cost means with quick distribution and a fast way of approaching large samples (Schaefer & Dillman, 1998; Dillman et al., 2009). To date, two forms of online surveys are mostly used while doing research: email-survey and web survey (Andrews et al., 2003). Email is one of the main communication methods in daily use (Petrovcic et al., 2016). There were 91% firms sending and receiving emails in daily operations, with around 10 days usage (e.g. sending and receiving emails) per month in 2016 in China (CNNIC, 2017). Because of the high degree of email utilisation by firms, email can play a central role in assisting large data collection in this study. In Parker's (1992) study which investigated AT&T employees, the response rate from the email survey was 63% which was higher than that from the traditional mail survey (38%). In particular, an email survey could achieve a 72% return rate within one month (Yun & Trumbo, 2000).

On the other hand, web survey is another form of online survey that has been conducted by the researcher for a decade (Dillman et al., 2009). The general procedures of collecting web survey are, first, constructing survey questions on a platform (Qualtrics is the web platform adopted in the current study), and, second, distributing the survey by sending an email with links (URL) to respondents, or asking respondents to use a smartphone to scan a QR code which will navigate their phones' webpage to the address with the survey (Sauermann & Roach, 2013). Respondents can fill in the survey by computer once they have clicked the link or by smartphone when they scan the QR code. Adopting web survey has two advantages. First, web survey can store responses in an account on a platform (e.g. Qualtrics or SurveyMonkey) and can transform the responses into different formats (.xls and.sav) which can match the data analysing format in Excel and SPSS (a statistical software package). For instance, when researchers open the data in SPSS, the responses

will be automatically categorised into a normal, scale and ordinal data by following the characteristics of the data generated from the survey questions. Because of the automatic data transforming on the web survey platform, it can mitigate the typing errors in terms of researchers having a chance to falsely transit values from survey to the data analysis system (SPSS) (Pallant, 2013).

Second, the same web survey can be stored in different languages, which are convenient for respondents from different geographical areas (Andreas et al., 2003). In the current study, the original questionnaire was constructed in English in the first stage. Since the target population is Chinese private firms, the English questionnaire was then translated into a simplified Chinese version on the Qualtrics platform. Since Qualtrics can switch the survey between the two languages, respondents can select the language as either simplified Chinese or the English version on the first page of the web survey. Until 2016, there were 690,000,000 people using the internet every day, and 90.1% of them searching the internet through smartphones (CNNIC, 2016). Web-survey could be viewed as an effective tool of data collection in China.

However, there are also disadvantages of using an email survey. First, the survey is an attached file within an email sent to respondents, which would provide chances for respondents to amend it and then cause biases within the responses (Andreas et al., 2003). Second, the email survey is barely noticed as a convenient means for data collection due to the complicated steps to fill in the survey. For instance, when respondents received an email with an attached survey file, they would read the contents of the email and then download the file. Thereafter, these respondents might print out the survey questionnaire and later scan the responses to a file before sending it back to the researchers. These complex filling and returning procedures will ruin the first impression of respondents and then will decrease their willingness to continue filling in the survey (Schaefer & Dillman, 1998). A low degree of respondents' willingness to fill in a survey questionnaire will generate nonresponse biases in which responses and nonresponses have large differences between them or create more negative responses within the survey (Dillman et al., 2009).

The drawbacks can also exist while researchers are adapting the web survey. First, the owners (aged between 50 and 70) of the family firms, especially the owners of traditional family firms, might have few skills to manipulate their smartphones or computers to fill in a web survey. Second, web survey would become a shortage of data collection when there are no internet connections for respondents (Joel & Evans, 2005). Finally, respondents might refuse to join web survey activities because they might question the reliability of the

survey link (URL) and consider the activities might contain fraud or a computer virus (Yan & Keusch, 2015).

In order to overcome the shortcomings of the email survey and web survey, this study will use the mixed-mode survey which combines email with web survey. Dillman et al. (2009) suggested mixed mode survey can assist researchers to increase the response rate in terms of conducting a survey mode (e.g. email survey) followed by another or more survey modes (e.g. telephone, and web survey). The idea of the current study is to distribute the survey with two links (URL and QR code), and an attached survey file via email. An email with formal layout design (e.g. a logo from the researchers' department) and its clearly stated purpose can increase the degree of trust from respondents and then enhance respondents' willingness to fill in the survey questionnaire (Schaefer & Dillman, 1998). With the help of the email survey, web survey would be more reliable than web survey in single mode. Other than that, the web survey is more convenient for respondents to manipulate than an email survey with simplified procedures. Respondents will be navigated to the survey webpage by clicking the survey URL in an email. Also, the survey questions are set and stored on a webpage that will give a consistent survey layout to respondents. The email survey, at the same time, can compensate for the shortage in which some respondents are unfamiliar with filling in web surveys on a smartphone or on a computer. Respondents can download the survey in a Word file and fill it in on a computer or print the survey out.

4.4.2 COMMON METHOD BIAS AND ITS PREVENTION

Common Method Bias (CMV) is defined as the bias derived from (a) situations in which the meaning of survey items is created by researchers in ways that distort the understanding of respondents; (b) or layout of survey items in ways which induce respondents to connect two responses together; or (c) situations in which the context (e.g. time and location) influences respondents to respond differently; or (d) when the surveying procedures themselves drive respondents to rate differently (or not, or inaccurately) a series of survey items (Podsakoff et al., 2003). Those biases generated from the data collection process can create a false internal consistency that will inflate or deflate the relationships among variables. It can further increase the chance of producing type 1 error (falsely rejecting a true null hypothesis) and type 2 error (retaining a false null hypothesis), which can threaten the viability of the data results (Chang et al., 2010).

In an ex-ante to the data analysis data, there are three types of common method biases which might be found in the current data collection procedure. First, respondents attempt to maintain consistency in their responses when those respondents are facing a similar type of

question (Chang et al., 2010). For instance, when 7-point Likert scales items are constructed with the same endpoints (e.g. such as ‘strongly agree’, ‘high level’, etc.) under every question, it can create a context in which respondents would maintain consistency of responses (Podsakoff et al., 2003). It can generate a similar level of correlation coefficient among different independent variables and a dependent variable. To address this type of CMV, this study used different endpoints for different scales. For example, 7-point Likert scales with 1 for ‘low degree’ and 7 for ‘high degree’ were conducted to measure the degree of family firm resources held by family firms, 7-point Likert scales with 1 for ‘not at all afraid’ and 7 for ‘very afraid’ for measuring ‘fear’ of losing one of the SEW dimensions, and the rest of the sets of items which have employed 7-point Likert scales adopted 1 for ‘strongly disagree’ and 7 for ‘strongly agree’. These efforts were in part to mitigate the possibility of CMV through survey design.

Another possible CMV exists in which respondents possess assumptions that the items they are currently filling in have a certain degree of relationship between them (Podsakoff et al., 2003). These assumptions can guide respondents to make connections among their responses to different sets of items. This can produce a type 1 error regarding a covariance among variables which is not otherwise supposed be there. In order to prevent such a type of CMV, survey items are suggested in which: (1) the measures of independent variables and measures of dependent variables should be separated into two different questionnaires filled in at two different points in time (the best scenario is at least a month apart) (Chang et al., 2010), and (2) adding measures for dependent variables with different formats (e.g. one measure employs 7-point Likert scales, open questions or multiple choice for another, but measuring the same constructs) (Meade et al., 2007). These two recommendations can decrease the chance that respondents would build up the assumptions which connect the responses while they are filling in the questionnaire. At the same time, researchers can compare the similarity of responses from different measuring formats of the same dependent variable in order to verify the similarities among the measures (Meade et al., 2007). In addition, a survey that is then filled in by two different respondents, but who hold a similar degree of knowledge, at two different points in time for each firm (Podsakoff et al., 2003), is highly desirable. The two respondents from the same environment can generate two responses that allow researchers to compare one against the other. Responses are identified as valid when the responses have a high degree of similarity (Podsakoff et al., 2003). This procedure was adopted for this study in which two respondents from each sampling unit (a family firm) were required to complete the survey, and the independent and dependent variables were also collected through two surveys at two different time points.

In the current study, the survey questionnaire is set to be filled in by two respondents per family firm. The two respondents should match the two criteria that one of them should be the owner or ultimate owner of a firm, and the other could be either a family employee or a non-family agent who is currently positioned in the top and middle management team. The reason for setting the two criteria can be attributed to: first, these two persons positioned in the same middle, or high management team can have a similar understanding of a firm; and second, the responses from one respondent can verify the responses of the other. For example, this survey contains 17 demographical questions asking for the personal background and general information (e.g. age of the firm, the name of a radical innovation output in past five years, and a number of family employees working in the firm). The responses from these questions are expected to have a high degree of similarity between the two respondents in a firm. In addition, the responses of innovativeness and family owners' willingness to adopt radical innovation from the two responses will be highly similar. By adopting this approach, two respondents filling in the surveys from a firm can further ease the CMV.

The last CMV possibility could be influenced by ambiguous, vague and unfamiliar terms involved in survey questions and set of items (Podsakoff et al., 2003; Chang et al., 2010). To address this type of CMV, the survey questions were double checked by the researcher to ensure no purely academic words or terminologies were used in survey questions and set of items. In addition, before distributing the survey via email and survey URL link, the researcher organised a focus group that contains 7 individuals in the non-academic world to primary test the survey items (pilot testing). These individuals were asked to review the survey and then detect the points where they do not understand and where terms might distort their understanding. Based on the suggestions from the focus group, the final survey questions were translated into Chinese by experts (the detail of this process will be explained in Section 4.4.5) before organising the second focus group which contains 5 Chinese individuals from the non-academic world. After ensuring the survey questions and set of items had no ambiguous, vague and unfamiliar terms, the survey was then formally distributed. In addition, to further reduce possible ambiguity in respondents' understanding of the survey questions, the explanations of the survey questions (in Chinese) are presented on the cover page in case the respondents are unexpectedly confused about a certain question while they are filling in the survey despite the aforementioned efforts (the detail will be presented in Section 4.4.3.1). This provided an additional safety measure. In sum, through the suggestions above, extensive efforts were made to combat the possibility of CMV entering the data ex-ante to the data collection, and robust efforts were made to ease the risk of CMV largely based on best practice.

4.4.3 QUESTIONNAIRE DESIGN

This survey questionnaire was designed with two separate parts: part A contains 47 questions (180 items) with measures of independent, dependent variables and control variables for two models that allowed approximately one hour to complete it; and part B entails 12 questions measuring dependent variables (performance assessment) and 11 questions measuring control variables. According to Dillman et al. (1993), when the number of questions exceeds 50, the response rate will decrease. However, the questionnaire contains the measures for two models in the current study for two main reasons. Both models were targeting family firms for the main investigation, and the two models were benefited by sharing parts of the measures. For instance, the first research model is to view the relationship between the mood and emotion of family owners while they are concentrating on a specific SEW dimension, and innovativeness (motivation and willingness to conduct and support innovation activities); and the intention of research model two is to investigate the relationship between firm resources (the combination of family firm resources and marketing resources) and willingness of family owners to adopt radical product innovation. Willingness to conduct innovation is identified as the variable crossing between the two models.

In addition, the two models can share demographic measures, such as age, gender, work experience, and firm size. If the data collection was conducted for two models at two different points in time, the responses from age, size, and work experience might be unable to share because of the changing respondents and employee turnover. Since this study targeted two respondents (family owners or owner-managers), if there were more than two family members working in a firm, there would be chances that the survey was filled by different persons at two different points in time from the firm.

Moreover, reconstructing survey questions will waste time. As the two models were targeting the same population, measures such as innovation willingness and SEW would be reconstructed to prevent the bias regarding respondents being familiar with the questions and selecting the answers without consideration (Podsakoff et al., 2003). However, considering most of the survey questions were cited from the previous family innovation studies, the re-constructing of these survey questions has to a large extent decreased the degree of reliability and validity (Liu et al., 2013). If re-constructing survey questions would be necessary, pilot study, which includes hiring 40 respondents (10% of the target sample size) with the same background to join the survey filling before the data collection, would become crucial to test if the majority of the hired respondents can understand the meaning of the measures (Liu et al., 2013). Hence, the time allocation in questionnaire re-construction

and data collection would be longer than collecting data once for the two models. Conducting one data collection for two models can achieve not only the time-saving but also can extend the control variables for each model. The more possible control variables were considered within a study, the more accurate the relationship between independent variables and dependent variables could be observed (Saunders et al., 2016). Therefore, the measures from one model can compensate for the measures of the other.

4.4.3.1 COVER LETTER FOR THE ONLINE SURVEY

The cover letter of the online survey contains two parts. The first part entails the purpose of surveying in terms of the study is trying to address the problems of producing innovation in family firms, and the statement of the contribution which could be generated from the responses in the academic world that intend to encourage the respondents to participate in this study. However, the statement did not show the theories or variables which are investigated by the researcher in order to prevent respondents inflating or deflating the correlation coefficient (CMV issue discussed in Section 4.4.2).

In addition, the cover letter also emphasises the confidentiality of the responses such that the collected responses will only be viewed by the researcher and emphasized the participation in the survey is voluntary. Under the context when confidential and voluntary survey responses are guaranteed, respondents would have little intention to make up their responses to allow those to look ‘nice’ in front of others (Podsakoff et al., 2003). Instead, they can behave in a free manner, and authentic responses would be provided.

By taking the suggestions from the individuals in the focus group, the second part of the cover letter includes the annotation for 20 survey questions which might confuse respondents while they are filling in the survey (discussed in the Section, 4.4.3). Indeed, the survey questions and set of items have been simplified by experts (explained in Section 4.4.5), but some sets of items were from the previous studies that might not fit perfectly in the target context. Respondents could generate meaning depending on their personal understanding which will then generate biases (Podsakoff et al., 2003). In particular, Chinese words and characters can sometimes create different meanings for respondents. The different meanings are not only from the wording but also from which context the ‘words’ are stating at (Wang, 2011). Therefore, it is necessary to stabilize the meaning of the survey questions in a certain context by adding an annotation. The table below demonstrates the survey questions in the English version and the Chinese version with Chinese annotations (shown in Table 3).

TABLE 3: SURVEY QUESTIONS WITH CHINESE ANNOTATION

Question No.	Survey Questions	Chinese translation	Annotations
04	How many years of work experience you have in your current industry?	请问您有多久的行业经验	行业经验 – 目前所在行业的时间
07	How many employees are currently in your firm	公司现在有多少员工（所有非正式和正式员工）	企业现在有多少员工—包括以本公司名义购买了相关社会保险的员工和没有买社会保险的与员工
08	Which city is your company located?	您的公司在哪一座城市	企业（公司）在哪一个城市—包括分公司或者总公司所在地
10	Family employees are defined as employees who have family relationships with each other, such as father, mother, son, brothers, sisters, cousins and so on. Non-family employees are defined as employees who do not have family relationships with current family members who dominate the company.	家族员工（成员）是有家族关系的员工（成员），比如父亲，母亲，儿子，兄弟，姐妹，表亲等等。而非家族员工（成员）则是与当前管理公司的家族没有家族关系的员工	家族员工—有血缘关系的（包括亲戚）； 非家族员工—无血缘关系的（朋友或者社会招聘）
17	How many the next generation members have work experience outside of your firm?	请问在您的下一代家族成员当中有多少人有非本公司的工作经验?	有非企业（公司）的工作经验 – 在其他公司上班的经历
23	How are many full-time employees (both family and non-family employees) employed in your firm?	在当前的公司中，有多少正式员工（所有员工：包括家族员工跟非家族员工）?	多少正式员工 – 正式员工为本公司名义购买了相关社会保险的员工
24	How many hours of training per employee per year are offered by your firm?	请问在当前公司中，每一个员工平均全年能获得多少个小时的培训 （大概数字）？（如果没有请填 0）	有多少个小时的培训（大概） -- 一天按 8 小时计算
25	How many percentages (approximate number) of non-family employees have received training out of the total number of non-family employees?	请问接受过培训 （商业性质的培训）的非家族员工跟所有非家族员工的比例是多少 （大约百分之几十）？（如果没有请填 0）	接受过培训的非家族员工跟所有非家族员工的比例 – 接受过培训的员工（不算家族员工）占所有员工（不算家族员工）的比例
29	How many new non-family recruitments do you have in the past three years?	请问在最近三年新招入了多少非家族员工?	新招入了多少非家族员工 – 社会招聘， 朋友介绍等没有血缘关系得员工
31	How much is your family's net worth (in thousands)?	当前公司的资产净值 （总资产减去负债）是多少 （大概）（单位：万元）?	企业的资产净值 – 通过审计的
32	How much is your current business net worth (in thousands)?	请问整个家族生意的资产净值 （总资产减去负债）是多少 （大概）（单位：万元）? （如果只有一间公司，答案跟上一题一样）	整个家族生意 – 包括所有家族成员担任法人的企业

40(2)	Experience in doing business in this market	公司在现在行业里的商业及市场经验	从企业成立时间划分：1 年内可选 1-3 项， 1-3 年可选 3-5 项， 3 年以上可选 5-7 项
40(13,14,15)	13 Strength of existing customer/channel relationships 14 Quality of customer/channel relationships 15 Duration of relationships with current customers/channel	13 公司跟客户，渠道伙伴和供应商建立的良好关系的强度 14 公司跟客户，渠道伙伴和供应商建立的良好关系的质量 15 公司跟客户，渠道伙伴和供应商所建立起的良好关系的持久性	企业跟客户，渠道伙伴和供应商合作最长的时间： 1 年以内可选 1-3 项，1-3 年可选 3-5 项， 3 年以上可选 5-7 项
40(25)	Access to capital	获得额外资本的能力 （银行借贷和平台借贷）	获得额外资本的能力 – 企业的融资能力
40(26)	The speed of acquiring and developing financial resources	获得和建立起项目资金的速度	获得和建立起项目资金的速度 – 人才储备以及公司的执行能力
40(27)	Size of financial resources devoted to venture investment	公司可以用来风险投资的资金	企业（公司）可以用来风险投资的资金 – 公司除了正常周转的资金外的长时间闲置的资金
41(12)	My family business is very active in promoting social activities at the community level	我们的家族企业在社会层面非常致力于推动社会活动	社会活动的多少 – 包括公益活动，慈善活动以及各类进校园招聘活动
41(18)	In my family business, the emotional bonds between family members are very strong.	在我们的家庭企业中，家人之间的情感联系非常强烈	家族企业的主要当家人的情绪和感情关系（婚姻， 亲戚等）
41(20)	Strong emotional ties among family members help us maintain a positive self-concept	家人之间强烈的情感关系能帮助我们保持积极的自我	亲情在企业的重要性
41(21)	In my family business, family members feel warmth for each other	在我的家族企业中，家人之间感到彼此温暖	好的健康的家庭关系能使企业保持健康的发展
41(24)	Family owners are less likely to evaluate their investment on a short-term basis	家族企业的拥有者不太会去评估他们的短期投资	短期投资 – 短期投资是指企业购入能够随时变现，并且持有时间不超过一年（含一年）的有价证券以及不超过一年（含一年）的其它投资，包括各种股票，债券，基金等
41(28)	Family members spend time together on social occasions	家庭成员会共同出席社交场合	家庭成员会共同出席社交场合 – 比如各种应酬，接待等
41(40, 41,42,43,44,45)	40 Among the number of previous investment cases, family investors had a strong desire to acquire high performance out of a venture investment within the first 5 years. 41 Among the number of previous investment cases, if the venture investment has been	40 在公司之前的投资案例中，家族投资人对在投资的前五年里获得很好的收获期望很大 41 在公司之前的投资案例中，对自己	企业的对外投资能力以及承担投资风险的能力

	counted as promising in future, family investors are willing to accept financial losses within the first 5 years	认定的潜力风险投资，家族投资人愿意承担在前五年里只有亏损的风险	
	42 Among the number of previous investment cases, family investors will exit if the benefits acquire from a venture investment did not meet their expectation (financial, marketing and sales performance) within the first 5 years	42 在公司之前的投资案例中，如果从风险投资中获得的收益 （比如：财务，营销和销售业绩）在前五年内没有达到预期，家族投资人将会选择退出该项目	
	43 Among the number of previous investment cases, family investors can accept the intended holding period of an extended multi-year or indefinite duration	43 在公司之前的投资案例中，家族投资人可以接受一个项目对 '只持有本金而无回报期限' 延长或者无限拖延	
	44 Among the number of previous investment cases, family investors prefer to invest in long-term projects (more than 5 years of return) than investing in short-term ones	44 在公司之前的投资案例中，跟短期的投资相比，家族投资人更喜欢投资长期项目（在五年之后才会有利益显现的项目）	
	45 Among the number of previous investment cases, family investors were reluctant to exit an investment in spite of disagreement with the non-family shareholders	在公司之前的投资案例中，家族投资人不会轻易地退出一个长期项目，即便在投资期间与其他非家族员工有矛盾的情况之下	
42	Please rate the extent to which you are afraid or not afraid of the following situations occurring in the next 10 years: (1 = very afraid; 7 = not at all afraid)	请您评价一下如果当下列情形发生在今后的十年里，您的害怕和担心的程度为 （1 = 一点不害怕； 7 =非常害怕）	以后的社会发生日新月异的变化，您是否担心企业传统的经营方式发生改变，有可能会冲击家族企业的利益
42(37)	That the contractual relationships will unlikely be mainly based on trust and norms of reciprocity in the future	在不久的将来，员工与企业的契约关系不再会主要基于信任和互惠关系	在不久的将来，领导与下属没有任何感情的关系，主要基于合同制。
42(38)	That building strong relationships with other institutions (i.e. other companies, professional associations, government agents) will unlikely be important for the family business	在不久的将来，与其他机构（其他公司，专业协会，征服代理等）建立牢固的关系对家族企业再也不重要了	在不久的将来，企业也不会去维护各种社会关系（如消防，工商）

42(39)	That emotions and sentiments will unlikely affect decision-making processes in the family business in the future	在不久的将来，情绪跟感情不再会影响家族企业中的决策	在不久的将来，比如人工智能的到来，决策者自我感情的冲动与否不会影响公司的决策
43	According to your knowledge, please rate the degree to which a new technological product is within the current industry in general	请您评价一下在公司所涉入的行业中发布的新产品或新科技产品的行为	所在的行业是不是一个产品更新速度很快的行业
43(1)	1 Very ordinary for our industry 7 Very novel for our industry	1 在我们这个行业中是很普遍的 7 在我们行业中很新颖的	比如手机行业发布新产品属于很普遍的现象，但是五金生产发布新产品是比较新颖的
43(2)	1 Not challenging to existing ideas in our industry 7 Challenging to existing ideas in our industry	1 对行业的现有理念没有挑战性 7 对行业的现有理念非常有挑战性	企业发布的产品对现有的理念挑战，如手机行业苹果 4 的触屏就对手机传统按键产品进行了比较有挑战性创新
43(5)	1 Uninteresting 7 Interesting	1 没趣 7 非常有趣	企业自我评价发布新产品无趣还是有趣

4.4.4 FILTERING PROCEDURES FROM TARGETED PRIVATE FIRMS TO POTENTIAL FAMILY FIRMS

This study conducted four steps to select potential family firms for investigation and build up contacts for data collection. We purchased data access to an information system managed by Chinese Product Net (an official entity controlled by the Bank of China), which has listed information (e.g. mobile number, email address, name of the ultimate owners and their positions, number of employees (approximate number), name of managers (some of the firms did not list), name of the shareholders, percentage of shares, and Chamber of Commerce membership information) of over 2500 private manufacturing firms (both listed and unlisted firms) in Chongqing. The filtering criteria for selecting family firms follow the family firm definition mentioned in the previous section.

Step 1: The ultimate owners should be individuals and natural persons (Cruz & Nordqvist, 2012), and they are positioned in the top management team (Berrone et al., 2012). The ultimate owner is the owner who holds 50% out of the total share of a firm. According to Faccio and Lang (2002), the ultimate owner generally has the right to control the firms, with a high degree of voting rights and power in decision-making. If individuals have held over half of the shares and a high degree of power to make strategic decisions (positioned at the top level of the management team), the firm which they are working with is viewed as a private firm (Faccio & Lang, 2002). Based on the definition of the family firm, it is a firm that is owned and controlled by family members that intend to operate through generations (Chua et al., 1999; Berrone et al., 2010). Thus, different from the private firm definition, family firms are owned and controlled by family members and the firm should be owned by at least one family member, and at least two family members are working in the firm (e.g. nuclear family members and extended family member). The next filtering process will select private firms which are controlled by two or more family members such as husbands and wives, brothers and sisters, and fathers and sons, and extended family members including grandparents, cousins, aunts and uncles.

Step 2: However, the relationship between husband and wife cannot be identified because most of the female spouses will not absorb their husbands' family names once they get married in China. Hence, identifying husband and wife solely on the system will be difficult unless annual reports which have addressed the relationships between owners and shareholders are provided (Li, 2005). Since accessing annual reports was limited on the system, there is an alternative way to suspect the private firm is a family firm managed by husband and wife in which a private firm has only two owners (one of them is the ultimate owner), one female and one male owner (the gender can be identified by checking the tile in

either ‘xiansheng (Mr)’ or ‘nvshi (Ms)’), who are at the same age level (the age differences within 10 years) (Li, 2005) and at least one of them is in a top management position (CEO, Chair of board directors, CFO and general manager). The firm which can match the criteria above was identified as a potential family firm in this study.

Because of siblings, and father and sons (daughters) sharing the same family names, the filtering criterion was then switched towards there should be at least one shareholder (except for the ultimate owner) working in the top management team who share the same family name with the ultimate owner (Li, 2005). Based on the previous family firm innovation studies, family involvement in ownership and management is increasing during the development of firms (Carney, 2005; De Massis et al., 2012; Chrisman et al., 2015), and family members are unwilling to give out shares and control to the outside parties (Gomez-Mejia et al., 2007). Although there are cases where family firms appoint agencies to take over ownership and control, the shares and control held by the agencies would be small (Carney, 2005). Based on these idiosyncratic characteristics of family firms, the private firms in terms of shareholders or shareholder-managers who are positioned in the top management team sharing the same family names with the ultimate owners are likely identified as family firms. Other than that, some families follow tradition allowing individuals who are in one generation to share a ‘generation name’ as the start of the given name in China (Li, 2005), for instance, with two family members named Qingdong Meng, and Qingguang Meng, ‘Qing (庆)’ is a shared ‘generation name’. These two individuals can be identified as siblings or cousins whose fathers are brothers from the same family (Li, 2005). If there is more than one shareholder working in the top management team sharing the same family name with the ultimate owner, and also generation name within a firm, the firm is likely viewed as a potential family firm.

There are situations in which the ultimate owner of a private firm is an ultimate female owner who has a different family name to the other shareholders/shareholder-managers, identified by the title ‘nvshi (Ms)’. In this circumstance, the filtering criteria are then to select the firms which have at least two shareholders, or shareholder-managers are sharing the same family name or the same family name and generation name. If these shareholders/shareholder-managers’ ages are 20 years younger than the ultimate owner, they could be suspected as the children of the ultimate owner; or if the shareholders/shareholder-managers share the same family name but one of them is at the same age level (age differences within 10 years) as the ultimate owner, and the rest of other shareholders are 20 years younger than the ultimate owner, the elder shareholders/shareholder-managers can be suspected as the

spouse of the ultimate owners, and the others are children. Thus, the private firm they are currently working with is then identified as a potential family firm.

The same 'family name' logic was also applied to identify family firms which are governed and managed by extended family members such as grandfather, cousins, aunts and uncles who are sharing the same family name. However, the weakness of this logic is to identify family firms which are owned and controlled by an ultimate private owner and an aunt who is the ultimate owner's mother's sister. One of the reasons is that a family could have several children before the 'one-child policy' was enacted in 1979 (Manea et al., 2015). In this case, with private firms that emerged from 1980, many family firms established between 1980 and 2000 could be managed by extended family members, and because family involvement in ownership and management could keep increasing from the day when a firm was established (Matzler et al., 2015; Chrisman et al., 2015). Meanwhile, a nuclear family could have only one child. Until 2015, many Chinese family firms have the experience of passing ownership and control to next-generation leaders. As the degree of management and ownership entrenchment would be gradually enhanced while succession is approaching (Chrisman & Patel., 2012), the ownership and control held by extended family members can be increased while the ultimate owners were passing ownership and control to their children. The situation regarding a family firm governed by a young ultimate owner and an owner's aunt who is the sister of the owner's mother can exist. Due to these two individuals not sharing the same family name, the private firm can be identified as either a private firm or a family firm, which was not selected in the sample.

To summarise this step, because of the information limitation on the data information system, the initial selection of family firms within a large private firm group matched the criteria starting from: (1) a firm should be owned by an ultimate owner who is an individual and a natural person, and positioned in the top management team; (2) within these private firms selected during step 1, there should be one or more than one shareholders/shareholder-managers sharing the same family name, or the family name and generation name with the ultimate owner; (3) if the ultimate owner is a female whose family name is different from the rest of the shareholders, then there should be at least two shareholders sharing the same family name or the family and 'generation' names; (4) if the private firm has no shareholders/shareholder-managers, or owners sharing the same family name, then selecting the firms which have only two owners (one female and one male) at the same age level (age difference within 10 years). Although the initial procedures of filtering family firms out of private firms by detecting relationships among the ultimate owners, shareholders and shareholder-managers were not deemed as perfect, the procedures can still select the potential family firms under the context regarding the information was limited in information

systems. This study would further select family firms by constructing survey questions, including ‘how many family members are currently positioned in the top management teams?’, ‘how many family employees are currently in the firm?’, ‘have you decided to pass your ownership and control to the next generation?’, and ‘do you wish/expect the future successor as president of your business to be a family member?’.

Step 3: As the population was targeted as family SME manufacturers, the number of full-time employees of the selected firms should range from 20 to 1000, and the revenue should not exceed 400,000,000 yuan (around 45,714,286 British pounds) (The Central People’s Government of the People’s Republic of China, 2011). Specifically, a micro-firm has employees ranging from 1 to 19 with annual revenue of less than 3,000,000 yuan; a small manufacturing firm has employees ranging between 20 and 300 with 3,000,000-yuan annual revenue; a medium-sized one has employees ranging from 300 to 1000 with 3,000,000 – 20,000,000-yuan annual revenue. Since the information regarding the revenue was not listed on the system, the selection criterion was initially located in picking up the firms with the employees ranging between 20 and 1000.

Step 4: Response rate could be low by email-survey and web survey if email was the only communication means through prior-notice, cover letter and survey file and link, and a reminder in China (Harzing et al., 2012). Although there are a large number of firms conducting email as a communication tool, the frequency of using email to communicate is low (around 8% of work-hours within around 10 days usage per month) among private firms (CNNIC, 2017). Such low frequencies of checking email accounts can cause respondents to miss a chance of filling in a survey questionnaire (Schaefer & Dillman, 1998). In addition, respondents would ignore the email sent by an unfamiliar researcher (Harzing, 2007). It can also explain why the face-to-face survey is a favourite way to collect data in mainland China (Philip et al., 2005).

The face-to-face survey is viewed as a data collection method in terms of researchers asking respondents to do surveys (either digital or paper surveys) while providing guidance of filling in the survey (Philip et al., 2005). The advantage of conducting a face-to-face survey includes achieving a higher response rate and fewer nonresponse biases (Philip et al., 2005). For instance, researchers can randomly pick up respondents while people are passing by on the street. Through communication and negotiation (e.g. financial incentives), researchers can persuade respondents to join the survey and then provide guidance to assist the respondents to go through every survey question.

However, data collection through a face-to-face survey would take an extended period of time in the current study, through appointment making with respondents, guiding them

through the survey questionnaire and finally receiving the final completed questionnaire. Because the target populations were family owners and family owner-managers who were busy with daily operations, the appointment could stay on owners' and owner-managers' waiting lists, and the actual meeting would be randomly scheduled. Considering an effective sample size (N= 50+8m, n represents the number of responses, and m is the independent variable) should be reached to generate statistical power (Pallant, 2013), the sample size should eventually reach up to 308 (there are 5 independent variables in model 1 and 8 in model 2). Following the effective sample size formula, 50+8*13 = 154. 154 represents 154 family firms. As this study planned that two family owners or owner-managers were going to fill the survey per firm, the total number of the completed survey should be 308. Since 308 is the final size of the response, the face-to-face data collection should target more than 154 family firms considering the response rate (Dillman et al., 1993). If the response rate of the face-to-face survey could reach to 20% as the same response rate within Szolnoki and Hoffman's (2013) study which targeted the Chinese market, the initial sample should reach up to 770 (308/20%) family firms out of a large group of private firms in Chongqing. If family manufacturers occupy 80% of private ones in Chongqing (National Bureau of Statistics of China, 2017), this study should target at least 963 (770/80%) private manufacturers. Thus, it will spend time on appointment-making with a large number of targeted private SME manufacturers. Apart from the time-consuming notice via email, mail and phone (company security will stop the researcher at the entrance) (Dillman et al, 2009), and waiting for the response via email and phone, appointment making would also bring problems because face-to-face surveys cannot be taken at the same period of time by two firms in which appointments made by different firms can clash with each other. Second, supposing enough appointments have been made, it will take more six months to accomplish the data-collection. Hence, the face-to-face survey would be less efficient without help from formal institutions (e.g. government, Chamber of Commerce, unions and so on).

In order to achieve a higher response rate and shorten the data collection period, this study relies on the Chongqing Chamber of Commerce. Chongqing Chamber of Commerce is a government agency and is the largest Chamber of Commerce in Chongqing, which has gathered a large group of private manufacturers (both listed and unlisted firms) (Zhao, 2005). Because of the Chamber of Commerce has power offered by government and access to a large group of private firms, if the email and web survey could be sent by the Chamber of Commerce, respondents could treat the survey filling activities seriously and will intend to complete it. Compared to the face-to-face survey, the Chamber of Commerce is faster to collect high-quality data with less nonresponse bias. However, considering the Chongqing Chamber of Commerce can only access members (registered firms), it can limit the sample

that the selected firms should belong to the Chongqing Chamber of Commerce. Hence, the last criterion of filtering is all the selected private firms should be registered in the Chongqing Chamber of Commerce. Through the filtering criteria of selecting potential family firms out of the private firms, 706 private firms were selected as the sample for the current study.

4.4.5 BUILDING UP THE RELATIONSHIP WITH CONTACTS

In order to build up trust and 'Guanxi' prior to data collection, we attempted to ask the Chongqing Chamber of Commerce to send the survey to the target firms via email. To ensure the authenticity of the responses, this study took two aspects into consideration: one was that the details of the data collection purpose were hidden to prevent respondents deflating or inflating the answers once they knew the test variables (Saunders et al., 2016); the other was comparing the similarities of two surveys which were completed by two individuals (family members) who were randomly selected in one management team (Pallant, 2013). The Chamber of Commerce was contacted five months before starting the data collection by an email, demonstrating: (1) the purpose of this study regarding supporting the family firm innovation study in the academic field, and (2) the action we wish a firm to take relating two owners or two managers (either family members or non-family members) working in the top or middle management team completing the survey. To compensate for the effort provided by the Chamber of Commerce, we provided one month of consultation services including marketing positioning and benchmark analysis for firms/social entities that needed help during July 2017 before the data collection, which was conducted in December 2017. The purpose of the early contact was, first, to develop the initial contact allowing the Chamber of Commerce notice of the data collection activities, and, second, to show the attempts of reaching the target sample.

In addition, the online survey was initially constructed in English and then translated into Chinese by a professional translation company and further checked by nine language professionals who hold bachelors' degrees in translation. Other than that, according to Dillman et al. (1993), a 'respondent-friendly questionnaire design', including structure and questionnaire layout, and easily understood questions, can increase the survey responses. To achieve a high degree of 'respondent-friendly questionnaire design' we hired two professionals: one was responsible for designing the structures to facilitate respondents' easy viewing on smartphones, and the other was to simplify and polish the questions. However, before the two professionals started, we organised a focus group containing six individuals (5 pounds per hour per person) to provide suggestions, observed by the two professionals. With the following notes taken in the focus group session, the two professionals constructed the final questionnaire (quality checked by researchers).

Before sending the final version to respondents, the Chongqing Chamber of Commerce had held a two-hour formal meeting with respondents. One week before the meeting, Chongqing Chamber of Commerce sent a meeting request to the 706 potential family firms via email, short-messages and WeChat (a communication software/application used on computer and smartphone) messages. The request explains the purpose of the study regarding the academic contribution, the high degree of confidentiality for the data, and a general definition of family firms. It then could address two things: first, the study is highly reliable and confidential; and second, it could save time that the owners who identified their firms are not family firms did not need to join the meeting.

452 firm owners and representatives joined the meeting (registered by signing their names behind the names of the firms on an attendance sheet). However, the questionnaire is long to complete which can induce negative feelings in the respondents who are busy with their work. When respondents' mood state is in negative affect, these respondents would negatively view the world around them so that biases will be generated (i.e. responses are skewed towards the negative side) (Podsakoff et al., 2003). During the meeting, I presented our work and went through each question within the questionnaire to make sure that everyone understood the survey questions, and also mentioned the above the financial incentives (100 yuan/100-yuan gift card per survey part A, and 50 yuan/50-yuan gift card per part B survey, but respondents who completed part B only will not receive financial support) of completing a survey (without missing a single question) through web survey, email survey or handing in a paper version (some might prefer the paper version) to the Chamber of Commerce. According to Chen et al. (2007), financial incentives can increase the response rate and somewhat decrease the level of resistance in survey completion in China. However, As the survey questionnaire will consume a long period of time, I made an agreement with private firms in the meeting suggestion to take the survey questionnaire twice only (details in next section), which limited the chances to conduct a longitudinal study in terms of collecting data twice for each model at two different points in time (i.e. four-time data collections in total).

The final version of the survey was then sent to the 706 firms by email which contained a page addressing the purpose of the survey, and the academic value that could be created by filling the survey, a page of confirmation letter signed by Chamber of Commerce, a motivation letter demonstrating they have the right to refuse to complete the survey, and finally an attached survey part A link which is directly connected to Qualtrics (a survey distribution system). The same email was sent twice around two weeks after sending the first one in order to make sure they had received the survey and to remind individuals who had received the first survey.

Eventually, 460 family CEOs, general managers, the board of the directors, CFO and middle line managers sent the completed questionnaire back from 230 private manufacturing SMEs, resulting in a 32% (230/706) response rate. We randomly called CEOs from 18 firms who did not complete the questionnaire and found these CEOs were extremely busy so they were reluctant to devote time to complete the questionnaire. In addition, because Chongqing Chamber of Commerce can have broad social links with other manufacturing groups (non-registered members), in order to increase the response, we again contacted the Chongqing Chamber of Commerce asking them if they could make efforts to send the digital links to all the non-registered members through WeChat, and we would share the report of the data analysis in the Chinese version with them. The number of responses was eventually enhanced up to 520 from 460 (60 new responses from 60 new firms) private firms with 230 firms sent two questionnaires, and 60 firms sent a single response only.

Following the same procedures of distributing survey part A, survey part B was sent to the respondents, who completed the survey part A, two months after the completion of survey part A. Because part B contains only 23 questions allowing respondents to take 9 minutes to fill it in, it showed quick responses (Appendix B). The responses from those who filled in survey part A but did not complete survey part B were later deleted by researchers.

Third, a further filtering process was conducted by checking the degree of completion of the questionnaire: (1) all the respondents should disclose both the name of their firm, and their position within the firm by filling in the questions ‘name of the firm’, and ‘position’, (2) there should be a family member(s) working in the firm by checking the questions ‘number of family employees working in the firm’, ‘number of generations working in the firm’, and ‘number of family members positioned in the board and management team’, (3) if there is only one ultimate owner managing and governing a firm, it is necessary to check if the ultimate owner has the intention to pass the current business through generations. Thus, the respondent should select ‘yes’ for either question of ‘have you decided to pass your ownership and control to the next generation?’ or ‘do you wish/expect the future successor as president of your business to be a family member?’. By checking the questions above, the family firms were identified out of the private firms. In addition, to establish a clear picture of incremental and radical innovation to respondents, question 31 provided the description of incremental innovation and radical innovation (Kyriakopoulos et al., 2016), and later stated relative questions regarding rating the degree of radicalness by comparing two things (e.g. iPhone 4 vs iPhone 4s) (Appendix A: Questionnaire). Respondents should complete question 31 to show their understanding of radical product innovation before entering the 7-point Likert scales rating questions regarding innovation. The responses will be abandoned if

respondents did not complete question 31. Finally, the questionnaire should have at least 95% completion, which was checked on Qualtrics in the section of questionnaire progression.

4.4.6 SAMPLE DESCRIPTION

Through the filtering procedures above, 213 family manufacturing SMEs were selected out from the 290 private firms which completed the questionnaire, with 14 firms providing 14 responses and other 199 firms providing 398 responses (412 responses in total). Within the data set, 308 respondents are male, 102 respondents are female, and 2 respondents are unwilling to identify their gender. In addition, 383 respondents are family members. However, among the 29 respondents who are not family members, 14 of them are positioned in the top management teams, acting as CEO (1), human resource manager (1), vice presidents (4), legal person (2), general manager (5), central administrator (2); and the rest are positioned in middle management, including central department manager (2), project manager (1), manager of financial department (4), manager of technical department (1), manager of R&D department (2), marketing manager (2), and sales manager (2). Finally, 335 respondents are responsible for decision making.

Based on the formula n= 50+ 8m, where n denotes the total number of a sample, and m represents the number of independent variables within a study, the effect responses for the current study will be at least 154 family firms (50+ 8*13=154) (Pallant, 2013). The size of the current responses is effective in that it shows a high degree of generalisability and statistical power.

4.5 VARIABLE MEASURES AND SURVEY QUESTION DEVELOPMENT

Since the sample contains 706 private manufacturing SEMs in Chongqing China, all the survey questions for data collection were conducted in Chinese from English-based measures (discussed in Section 4.3). Most of the measures for the constructs within both models are existing and well-established scales from previous family firm innovation studies, for instance FIBER for measuring SEW (Berrone et al., 2012), family social capital measures (Chirico & Salvato, 2014) and firms' financial resources measures (Morgan et al., 2006). However, there are no existing measures directly capturing three constructs, namely fear of losing SEW dimensions in model 1; and 'patient capital' and 'willingness of adopting radical innovation' in model 2. In this section, all the measures for the constructs and the procedures of developing measures for the three key constructs will be separately demonstrated under model 1 and model 2 sections.

4.5.1 VARIABLE MEASURES AND SURVEY QUESTION DEVELOPMENT FOR MODEL 1

Model 1 consists of 6 sets of survey questions which include 5 sets of items measuring SEW, and 1 set of items measuring innovativeness of family firms. Both independent and dependent variables are measured by using items with a firm-level reference.

4.5.1.1 SEW DIMENSIONS AND FEAR OF LOSING SEW DIMENSIONS (INDEPENDENT VARIABLES)

There are 5 dimensions within SEW, family control and influence, identification of family members, binding social ties, emotional attachment of family members, and renewal of family bonds (Berrone et al., 2012). The measures of SEW dimensions are the set of items from Filser et al.'s (2017) study, relying on 7-point Likert scales from 1 for 'strongly disagree' to 7 for 'strongly agree', under the leading question 'how do you rate the relationship among you and your family members, family employees, and family business?' (Table 4).

TABLE 4: ITEMS MEASURING SEW DIMENSIONS CONSTRUCT

SEW dimensions (7-point Likert scales) (Filser et al., 2017)	Questions
Family control and influence	I) The majority of shares in the family business are owned by family members II) In the family business, most executive positions are occupied by family members III) The board of directors is mainly composed of family members
Identification of family members with the firm	I) Family members have a strong sense of belonging to the firm II) Family members feel that family business success is their own success III) Being a family member of the family business helps define who we are IV) Family members are proud to tell others that we are part of the family business
Binding social ties	I) In the family firm, non-family employees are treated as part of the family II) In the family business, contractual relationships are mainly based on trust and norms of reciprocity III) Building strong relationships with other institutions (i.e., other companies, professional associations, government agents, etc.) is important for the family business

Emotional attachment of family members	I) Emotions and sentiments often affect decision-making processes in the family business II) Protecting the welfare of family members is critical to us III) In the family business, affective considerations are often as important as economic considerations IV) Strong emotional ties among family members help us maintain a positive self-concept
Renewal of family bonds through an intra-family succession	I) Continuing the family legacy and tradition is an important goal for the family business II) Family members would be unlikely to consider selling the family business III) Successful business transfer to the next generation is an important goal for family members IV) Preservation of family control and independence are important goals for the family business

Due to the fact that measures for the 'fear of losing SEW' are limited among previous family firm innovation studies, the set of items for measuring 'fear of losing SEW' dimensions were developed based on four steps. First, we followed the definition of the term 'fear' emotion (Kaufmann & Vosburg, 1997), and the causal relationship between 'fear of losing' and 'strategic action' (George & Zhou, 2007), and the definition of the term 'SEW' dimensions (Gomez-Mejia et al., 2007; Berrone et al., 2010; Berrone et al., 2012). This definition and causal relationship have demonstrated the fear will be emerging and gradually increased while managers are increasingly concerning on protecting one thing from losing (George & Zhou, 2007). It then links the findings in Chrisman and Patel's (2012) study, regarding family owners' willingness to adopting innovation is increasing while the stage of succession is approaching. The approaching of succession will shift family owners' attention towards maintaining renewal of family bonds, which, at the same time, will also increase the owners' fear that a proper maintaining of such a dimension would be unlikely to be maintained in the future. The owners' willingness to pursue innovation will then be enhanced in which the benefits acquired from an innovation would increase the level of continuity of firms in the future (Chrisman & Patel., 2012). Therefore, the set of items of measuring the degree of fear of losing SEW dimensions can be developed by allocating 'fear' emotion and 'future tense' on each item within the original SEW dimension measures. For instance, the question 'the majority of shares in the family business are owned by family members' within the family control, and the influence dimension was then amended to 'that the majority of shares in the family business will not be owned by family members in the future' (shown in Table 5).

Following the steps of developing a new set of items for measuring a construct (Liu et al., 2015), the developed items were constructed by employing the 7-point Likert scales from 1 for 'not at all afraid' to 7 for 'very afraid' under the question 'please rate the extent to which

you are afraid or not afraid of the following situations occurring in the next 10 years'. These items were brought to an expert focus group and then to a second focus group in order to ensure high content validity. The Cronbach alpha of the set of items is .966, and the eigenvalue of this factor has reached above 1 in factor analysis and has explained 74.7% of the total variance. Therefore, the measures of the fear of losing SEW dimensions construct are reliable and valid.

TABLE 5: ITEMS MEASURING FEAR OF LOSING SEW DIMENSIONS CONSTRUCT

Fear of losing SEW dimensions (7-point Likert scales) (Kaufmann & Vosburg, 1997); George & Zhou, 2007; Filser et al., 2017	Questions
Fear of losing family control and influence	I) That the majority of shares in the family business will not be owned by family members in the future II) That most executive positions will not be occupied by family members in the future III) That the board of directors will not be mainly composed of family members in the future
Fear of losing identification of family members with the firm	I) That family members will unlikely to have a strong sense of belonging to the firm in the future II) That family members will unlikely feel that the family business success is their own success III) That being a family member of the family business will unlikely help define who we are IV) That family members will unlikely be proud of telling others that we are part of the family business in the future
Fear of losing binding social ties	I) That non-family employee will unlikely to be treated as part of the family in the future II) That the contractual relationships will unlikely be mainly based on trust and norms of reciprocity in the future III) That building strong relationships with other institutions (i.e. other companies, professional associations, government agents) will unlikely be important for the family business
Fear of losing emotional attachment of family members	I) That emotions and sentiments will unlikely affect decision-making processes in the family business in the future II) That is protecting the welfare of family members will unlikely be important to us in the future III) Those affective considerations will unlikely be as important as economic considerations in the future IV) That strong emotional ties among family members will unlikely help us maintain a positive self-concept in the future
Fear of losing renewal of family bonds through an intra-family succession	I) That the continuing the family legacy and tradition will unlikely be an important goal for the family business in the future II) That we will likely consider selling the family business in the future III) That successful business transfer to the next generation will unlikely be important goals for the family business IV) That preservation of family control and independence will unlikely be important goals for the family business

4.5.1.2 INNOVATIVENESS OF FAMILY FIRM (DEPENDENT VARIABLES)

The set of items measuring innovativeness within family firms was from Filser et al.'s (2017) study, relying on 7-point Likert scales with 1 for 'strongly disagree' to 7 for 'strongly agree' (Table 6). This set of items was guided by the question 'how you rate the relationship between you and your family members, family employees, and family business?'.

TABLE 6: ITEMS MEASURING INNOVATIVENESS WITHIN THE FAMILY FIRM

Innovativeness (7-point Likert scales) Filser et al. (2017)	Questions
Firm innovativeness	I) We consider ourselves an innovative company II) Our business is often first to market with new products and services III) Competitors in this market recognize use as leaders in innovation

4.5.2 VARIABLE MEASURES AND SURVEY QUESTION DEVELOPMENT FOR MODEL 2

Model 2 consists of 9 sets of family firm resource survey questions which include 6 sets of items measuring marketing resources constructs, and 3 sets of items measuring family idiosyncratic resources. These independent variables are measured by using items with firm-level reference.

4.5.2.1 MARKETING RESOURCES (INDEPENDENT VARIABLES)

Marketing resource measure items were sourced from Kyriakopoulos et al. (2016), Morgan et al. (2003), and Morgan et al. (2006), which covered sets of items including market knowledge, reputation resources, relational resources, technological resources, financial resources and human resources (shown in Table 7). These items had requested the opinion from owners of family firms towards the degree of resources held by firms by the leading question 'With respect to your current understanding of your firm, how would you rate the level of resources held by your firm through the following?'. The survey items followed 7-point Likert scales, value ranging from 1 for 'low degree' to 7 for 'high degree'.

TABLE 7: ITEMS MEASURING MARKETING RESOURCES CONSTRUCT

Market resources (7-point Likert-scales)	Questions
Market knowledge Kyriakopoulos et al. (2016)	I) Knowledge of competitors in this market. II) Experience in doing business in this market. III) Information and intelligence about the marketplace. IV) Knowledge of customers in this market. V) Knowledge of the channel in this market.
Reputation resources (Morgan et al., 2003)	I) Brand name awareness II) Distinctive of our brand images III) Appeal of our brand 'personality.' IV) The strength of our brand image
Relational resources (Kyriakopoulos et al., 2016)	I) The strength of existing customer/channel relationships II) Quality of customer/channel relationships III) Duration of relationships with current customers/channel IV) The closeness of existing customer/channel relationships
Technological resources (Kyriakopoulos et al., 2016)	I) Technical and scientific knowledge and information relevant to the industry II) Patented knowledge relevant to the industry III) New technical and scientific discoveries relevant to the industry IV) Relevant discoveries by our technical and scientific personnel
Financial resources (Morgan et al., 2006)	I) Access to capital II) The speed of acquiring and developing financial resources III) Size of financial resources devoted to venture investment IV) Ability to find additional financial resources when needed
Human resources (Morgan et al., 2006)	I) Knowledge of our non-family personnel II) The quality of our non-family personnel III) Experience of our non-family personnel IV The skills of our non-family personnel

4.5.2.2 FAMILY IDIOSYNCRATIC RESOURCES (INDEPENDENT VARIABLES)

The measures for family idiosyncratic resources construct include 3 sets of items regarding family social capital, family human capital and family patient capital. The items set to measure family social capital are the existing 7-point Likert-scale items from 1 for 'strongly disagree' to 7 for 'strongly agree' from Chirico and Salvato's (2014) study. Meanwhile, the items of measuring the family human capital construct come from the study of Ahrens et al. (2015), containing 5 open questions and 1 multiple selection question (Table 8).

However, considering the limitation of the lack of measures of patient capital among the existing studies, this study has taken three steps to develop the measures for 'patient capital' and constructs to ensure its construct validity (Liu et al., 2013). First, we generated a set of items for patient capital based on the patient capital definition and characteristics from three patient capital studies. One is specifically focusing on family firms (Sirmon & Hitt, 2003), and the other two are focusing on normal/non-family firms (Bicen & Johnson, 2015; Deeg &

Hardie, 2016). Then the constructed survey items were handed to a group containing an expert in accounting and finance, an expert from entrepreneurship and one from the family business sphere from Durham University in the UK. Second, we held a focus group and asked the three experts about their opinions in identifying patient capital in private firms and family firms. After receiving the feedback and suggestions from the expert focus group, third, we organised another focus group containing 10 owners from 4 family firms (these firms are not included in the pool of final responses). While demonstrating the items in front of them, we asked them to judge if the items have captured the patient capital construct and their opinions in which there might be additional items added. These individuals within the second focus group provided a high content validity rating about the items. Exploratory factor analysis was later conducted showing the eigenvalue of a patient capital factor is greater than 1, and this factor explained 66.6% out of the total variance. Also, the reliability test shows the set of items is above .8.

TABLE 8: ITEMS MEASURING FAMILY IDIOSYNCRATIC RESOURCES CONSTRUCT

Family idiosyncratic resources	Questions
Family social capital (7-point Likert scales) Chirico and Salvato (2014)	I) Family members spend time together on social occasions II) Family members maintain close social relationships III) Family members can rely on each other without any fear that some of them will take advantage even if the opportunity arises IV) Family members always keep the promises they make to each other V) Family members share the same ambitions and vision VI) Family members are enthusiastic about pursuing the collective goals and missions of the whole organization
Family human capital (open and closed questions) Ahrens et al. (2015)	I) How many the next generation members have work experience outside of your firm? II) Have you ever sent your child/children to study abroad? III) How many generations are involved in management? IV) How many family employees have a university degree? V) How many family employees have a business education? VI) How many family employees are currently in the firm?
Family patient capital (7-point Likert scales) (Liu et al., 2013; Sirmon & Hitt, 2003; Bicen & Johnson, 2015; Deeg & Hardie, 2016)	I) Among the number of previous investment cases, family investors had a strong desire to acquire high performance out of a venture investment within the first 5 years. II) Among the number of previous investment cases, if the venture investment has been counted as promising in future, family investors are willing to accept financial losses within the first 5 years III) Among the number of previous investment cases, family investors will exit if the benefits acquire from a venture investment did not meet their expectation (financial, marketing and sales performance) within the first 5 years IV) Among the number of previous investment cases, family investors can accept the intended holding period of an extended multi-year or indefinite duration V) Among the number of previous investment cases, family investors prefer to invest in long-term projects (more than 5 years of return) than investing in short-term ones VI) Among the number of previous investment cases, family investors were reluctant to exit an investment in spite of disagreement with the non-family shareholders

4.5.2.3 DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION (DEPENDENT VARIABLE)

Since the measures for 'degree of family owners' willingness to pursue radical innovation' was missing in prior family firm innovation studies, we conducted procedures of developing a new set of items by following the same steps as those used to construct items for 'patient capital'.

Through comparing the definitions of 'willingness to pursue radical innovation' from De Massis et al. (2014) and Chrisman et al. (2016), and definitions of 'willingness in planning to

invest in a business project' (Alexander et al., 2008), a similarity can be identified. The willingness was generated when decision makers understood the benefits of a specific action. For instance, the degree of family owners' willingness to pursue radical innovation increases when the benefits which will be acquired from the innovation are certain (Chrisman et al., 2015). Meanwhile, the managers' willingness to plan for investment is also based on the results of the investment indicators including potential benefits from an investment, costs and trade-offs, and degree of increase in the level of competitive advantages (Alexander et al., 2008). Because of the similarity, the set of survey items in measuring 'willingness to pursue radical innovation' was developed based on the existing items of measuring 'willingness to invest in a business project' from Alexander et al.'s (2008) study (shown in Table 9). The set of items relies on the 7-point Likert scales from 1 for 'strongly disagree' to 7 for 'strongly agree', under the leading question 'how you rate the relationship among you and your family business?'.

The later steps of identifying content validity were rated through two focus groups (one contains experts from the areas of entrepreneurship, marketing, and management; the other includes 10 owners from 4 family firms). The exploratory factor analysis shows the eigenvalue is above 1, and the factor has explained 88% of the total variance. In addition, the reliability of this measure is above .9.

TABLE 9: ITEMS MEASURING DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION CONSTRUCT

Family owners' willingness (7-point Likert scales)	Questions
The degree of family owners' willingness to pursue radical innovation (Alexander et al., 2008)	I) We feel quite certain of the benefits we could expect to get if we adopted a radical innovation II) We are quite sure of what the relevant trade-offs are among the costs and benefits of launching a new product III) We will have to change the firms' behaviour significantly to attain the potential benefits of launching a new product IV) Launching a new product would allow my firm to acquire the competitive advantage that my firm cannot easily get now

4.5.3 CONTROL VARIABLES

Based on prior studies of family firm innovation, 12 control variables (firm age, size, industrial affiliation, gender, age, educational background, work experience in both industry and firm, owners' ambition towards firm development, environmental dynamism, environmental fitness and domestic munificence), which have shown an impact on innovativeness and strategic decision-making towards innovation in family firms, are considered within this study (for both model 1 and model 2). First, firm age is examined by

former researchers that have an impact on firms' innovativeness in terms of the older the firm is, the less liability of newness the firm would have, which brings the potential for firms to pursue innovation (Jurgensen & Guesalaga, 2018). The firm age is measured by the number of years since the firm was formally established (Czarnitzki & Delanote, 2012). Second, the size can demonstrate the degree of resources (e.g. financial resources and human resources) held by firms that would lift the firms' ability to innovate (Chrisman et al., 2016), and, at the same time, it can increase the family owners' willingness to pursue innovation (Covin et al., 2016). Size is measured by the total number of full-time employees within a company (Filser et al., 2017). Third, industrial affiliation was controlled by categorising firms into specific kinds of manufacturing industry, such as food processing, tobacco products and clothing, and shoes and hats. According to Morgan et al. (2003), there would be a different degree of effects between variables under different categories within an industry so that the implications from the very effects can typically be treated under certain categories within a specific industry.

Apart from the control variables at the firm-level mentioned above, this study also took an individual level into account. First, it controlled the gender, age and educational background of the family owners. Based on the finding from Eddleston and Powell's (2012) study, women-owned business demonstrated slow growth, low sales and low financial performance because women owners have devoted more attention to balancing the life from business and family that women-owners would devote fewer efforts in accessing resources (e.g. financial, human and social resources) from the business market. By acquiring low benefits from resources, women-owners would have a lower chance to pursue innovation, especially radical innovation (Singh & Gaur, 2013). According to Maikova and Kljucnikov (2016), older entrepreneurs have more experience and a greater chance of accessing larger financial capital than younger entrepreneurs within a market. In this circumstance, older entrepreneurs have a greater chance to realise the intention of innovating. In addition, educational background, and owners' work experience within both firm and industry were controlled. Higher educational background and greater work experience of owners can create a high degree of sensitivity of opportunities, which can increase the chance of pursuing innovation (Orser et al., 2010; Filser & Eggers, 2014). Educational background is measured by asking the respondents 'what is the highest level of education you completed?', and the work experience of family owners is measured by years of working in the firm and industry.

Second, environmental dynamism is viewed as the period of market audiences (e.g. customer, consumers, and suppliers) changing their tastes and interests (Prajogo, 2016). The higher the environmental dynamism, the shorter the period in which the audiences will

change their tastes and interests. To maintain the market position and firm performance (e.g. sales and revenue), firms would then be motivated to pursue innovation in either an incremental or a radical manner (Prajogo, 2016). It will, in turn, drive firms to acquire higher innovativeness. The environmental dynamism is measured by 3 items with 7-point Likert scales (Fang, 2008) from 1 for 'strongly disagree' to 7 'strongly agree' under the leading question – 'how do you rate the environment of the current industry?'

Third, environmental fitness can impact on owners' willingness to pursue radical innovation. For instance, firms would be more and more inert during development in terms of whether decision-making should go through a formalised process, and bind with solid connections with a certain number of suppliers and customers (Hannan & Freeman, 1977). It can decrease firms' strategic reactions in dealing with environmental change. However, owners are willing to pursue radical innovation when the gap between the business environment and firm is large for the purpose of survival (Le Mens et al., 2015). Environmental fitness is measured by 5 items from Fang's (2008) study, employed 7-point Likert scales from 1 for 'strongly disagree' to 7 for 'strongly agree'.

Fourth, family owners' ambitions play a significant role in driving firms to either pursue innovation or stay at the current state (maintaining daily operation) (Miller et al., 2015; Chrisman et al., 2015). Owners' ambitions are measured by multiple selections with 'maintain the status quo and sustain the current activities of the firm' and 'grow your firm and focus on investment in the new market'.

4.6 DATA ANALYSIS PROCEDURE AND STRATEGY

This section will introduce techniques within data analysis, and display the reasons to select the specific technique to support the current research questions: 1) Does the perception of future loss of SEW influence the firm innovativeness of family firms? 2) What firm resources can direct family owners' willingness towards pursuing radical innovation? All of the 412 observations (398 responses are from 199 firms which provided double responses, and 14 responses are from 14 firms) were used for data analysis.

The analysis will start with non-response bias, exploratory factor analysis, reliability, and confirmatory factor analysis. First, the representativeness of the responses to the target sample is tested, and, second, whether the measures were measuring what they were intended to measure depending on the theory and concepts of variables (Bryman, 2008). After the data representability, validity and reliability have been confirmed, data analysis will move to the confirmatory factor analysis and structural equation modelling at the end of this

section. This section details and reasons the analytical procedures and strategy followed to scrutinise the data and test hypotheses.

4.6.1 NON-RESPONSE BIAS

If the responses provided by current respondents are different from the potential responses from those who do not respond, non-response bias can occur (Bryman, 2008). Normally, there are two issues that can engender non-response bias. First, more than a small number of people refused to join the questionnaire completion effort or have not been reached within a sample (Salant & Dillman, 1994). For instance, the sample of the present study initially targeted 1412 respondents from 706 firms, but eventually received 520 responses from 290 firms; this leaves 186 non-responding firms. In this circumstance, the acquired 520 responses might not represent the responses from the rest of the potential respondents from the 186 firms, which has a chance to produce non-response bias as a consequence. Second, the responses from potential respondents might be more important than the responses from the current respondents (Dillman et al., 1998). This can occur among different samples which might also apply to the current study although the current study focused on a single sample in one geographical area. This study will randomly compare responses from 50 respondents who responded early to the questionnaire and 50 respondents who responded late to the questionnaire for both survey part A and B. The results will be shown in Chapter 5, Section 5.4.

4.6.2 EXPLORATORY FACTOR ANALYSIS

Factor analysis is a statistical technique for assessing the relevance of a theoretical concept to its intended variables and prior to hypothesis testing (Hair et al., 2006). The basic idea of factor analysis is to group the items with the same pattern (high degree of similarities) together under a factor (Hair et al., 2006). Generally, there are two techniques within factor analysis: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is a technique to discover the least number of items (indicators) to explain and load the most variance on a latent variable (a factor), and, at the same time, check the covariation among the indicators (Thompson, 2004). A factor is identified as a latent variable when the variable itself cannot be measured by direct observation (Diamantopoulos, 2011). For example, a latent variable, such as the degree of an individual's life satisfaction, is expected to be measured by constructing items towards its different aspects. In this example, the degree of individuals' life-satisfaction can be measured by viewing the sports experience, general feeling of an individual's life, and individuals' degree of work-life balance (Puente-Diaz, 2012). By analysing the results from the three items/indicators mentioned above,

researchers could eventually draw a conclusion towards the degree of life satisfaction of an individual (Diener et al., 1985).

However, the indicators which are either employed from previous studies or constructed by researchers can sometimes fail to measure a factor in an accurate way in different research contexts (e.g. geographical contexts, and cultural contexts) (Conway & Huffcutt, 2003). In this circumstance, the measure of a latent variable may have a low degree of content validity, and the constructed indicators fail to correspond to the concept of the latent variable in a certain context (Diamantopoulos, 2011). This will engender problems in that these indicators, with a low degree of content validity, can hold low variation in factor loadings (variation of latent variable influenced by indicators), which will drive researchers to construct more indicators to measure the factor to increase the reliability of the measure (Pallant, 2013). Sometimes, the number of indicators could be overly constructed by researchers, especially when there are few measures for a factor from previous studies. Indeed, a measure with numbers of items can increase the width of a latent variable and in turn result in a high degree of reliability (Pallant, 2013). However, an indicator can produce some degree of error variance (Diamantopoulos, 2011). Under the context of the individual's life satisfaction example, as the indicators were established by employing 5-point Likert scales (1 for 'strongly dissatisfied' and 5 for 'strongly satisfied'), respondents could select either value 4 or 5 when their actual intention is between 4 and 5. Then, the measuring error would be generated because the value selected by respondents deviated from their actual intention (Reio & Shuck, 2015). Therefore, although a large number of items can increase the reliability of a measure (Pallant, 2013), overly adding a number of indicators can accumulate a high level of error variance of a testing factor which could be away from the actual factor supported by the theory (Diamantopoulos et al., 2012).

EFA can play a significant role to detect which indicators are influential towards factor loading (i.e. a factor loading is the degree of the variance of a factor explained by an indicator) (Pallant, 2013). Researchers can select the indicators which explain the most variance of a factor (explaining at least 60% of the variance, please see Section 4.6.2.3 to refer this criterion) and then eliminate the others (Reio & Stuck, 2015). The factors then could be accurately measured by the least number of indicators with minimised error variance.

Sometimes, there might be covariance among the indicators which can confuse researchers regarding which indicator plays the key role in explaining the variance of a factor (Diamantopoulos et al., 2012). EFA helps to check the level of covariance among indicators and provides suggestions for researchers to delete non-important indicators which are

causing the covariance (Pallant, 2013). After conducting the EFA, the constructs can be purified and reduced such that the data will be more concentrated towards explaining specific factors that should represent the theoretical constructs, and provide a basis for the further CFA analysis.

4.6.2.1 SIZE OF SAMPLE RESPONSE ASSESSMENT AND FACTOR EXTRACTION

In the current study, the EFA test will start by examining the responses to determine whether the size of the sample responses have met the criteria for conducting EFA analysis (Pallant, 2013). Based on the rule of thumb, the sample responses should exceed the amount of 100, and over 200 sample responses would be viewed as adequate that results in Kaiser-Meyer-Olkin (KMO) value over .6 (Gorsuch, 1997). Based on the criteria above, the sample responses within the current study exceed 400, which creates a favourable condition for EFA analysis.

Factor extraction entails extracting initial factors which were derived for each item being analysed (Gorsuch, 1983). These initial factors are related to the proportion of variance explained by items within the analysis, denoted by eigenvalue (Pallant, 2013). The eigenvalue is derived from the number of internal correlations among the items which can be clustered together (Widaman, 1993). For instance, when eigenvalues are less than 1, it demonstrates indicators under a factor are weakly correlated with one another, which will result in the factor having little ability to explain variance within a variable; as the degree of correlation increases among the items, eigenvalues will increase and then exceed 1, which shows the corresponding factor can explain the variance of a variable (Pallant, 2013). Thus, the numbers of factors, which will be entered into the rotation analysis, will be determined by the number of factors which possess an eigenvalue over 1.

The factor extraction could also be viewed in a scree test regarding the amount of variance explained by a number of factors showing on a graph (Pallant, 2013). The graph will list the factors ranging from the most significant factors to the least significant factors, from left to right (Blunch, 2013). Based on the rule of thumb, the cut-point is located at the junction cross between steeply a downward line and a horizontal line (‘elbow’ point) (Pallant, 2013). The factors, which start from the ‘elbow’ point towards the righthand side, would be identified as non-significant factors (Blunch, 2013).

4.6.2.2 ROTATION

The results from rotation are to explain the level of correlation among items, and then group the items which have the same pattern together under a factor (Pallant, 2013). There are two

EFA rotations mainly conducted by researchers while using SPSS, orthogonal and oblique factor solutions (Tabachnick & Fidell, 2013). Orthogonal rotation is based on the assumption that factors were not correlated with each other; while oblique rotation assumes that the factors can correlate with one another (Pallant, 2013). Normally, the rotation will first start with oblique rotation to check how strong the correlations between factors are, and then switch to orthogonal testing, and finally compare the final results between the two-factor solutions and select the right solution which matches the context model (Pallant, 2013).

Varimax is a common method under orthogonal approach which can maximise the total variances within a factor, and at the same time minimise the number of indicators and retain the factors which have high factor loading on factors in SPSS; while Direct Oblimin, a common approach within oblique rotation, allows factors to be correlated without maintaining the independence of the factors (Bernaards & Jennrich, 2005). The present study will first adopt Direct Oblimin to examine the strength of the correlation between factors of the present study. Because the factors are not correlated in the present study, the solution will then switch to Varimax to maximise the total variances within a factor.

4.6.2.3 FACTOR LOADINGS

Factor loadings determine how strongly each indicator relates to the factor (Blunch, 2013). Generally, the larger the factor loading between an indicator and a factor, the more important the indicator that can explain the factor (Kline, 2016). A rule of thumb indicates the minimum significant loading coming from each item should be the cut-point of .5 in absolute value, and the loadings equal .7 or above are considered as well-defined structure (Hair et al., 2006). In the current study, the criteria will be set at .5 level, and any loading below this level will be considered as not substantial (Briggs & Cheek, 1988).

When .5 cut-point has applied, it is expected to see all the relevant indicators from one theoretical background are grouped under the same category (Blunch, 2013). If an indicator showed a high degree of loading (above .5) across different groups (factors), it is suggested that researchers could re-read the relevant measure item in the questionnaire and then compare the measurements with the measures from the cross-loaded groups (Pallant, 2013). Researchers could remove the indicators which are cross-loaded on other groups and re-test the EFA (Femandez, 2011).

4.6.2.4 RELIABILITY ASSESSMENT

A construct is measured by a set of items, and the items cover as many aspects of the construct as possible. Reliability assessment is used to check whether a set of items

measures the same underlying construct (Pallant, 2013). The most common method to check reliability is to use an internal consistency indicator, the Cronbach's alpha coefficient, detecting how similar are the values selected by respondents within a set of items (Pallant, 2013). When Cronbach's alpha coefficient is above .7 (above .8 is defined at a good level, and above .9 is viewed as at an excellent level), it demonstrates that the values of a set of items selected by respondents are similar, and can be identified as an acceptable level of reliable measure of a construct within the current context (DeVellis, 2012).

4.6.3 STRUCTURAL EQUATION MODELLING (SEM)

Structural equation modelling is composed of a series of hypotheses, which demonstrates the ways the variables are generated and related (Hu & Bentler, 1999). There are two reasons that structural equation modelling (SEM) was selected for the current study. First, SEM can detect how well the measures reflect the constructs within a model by demonstrating the quality of factor solution, factor loadings, and errors of measures (Kelloway, 2015), and treat the relationships between indicators and constructs more rigorously in the model which contains mostly latent variables. Researchers can better view the relationships between indicators and constructs with SEM instead of examining correlations or regressions between each indicator and constructs separately (Pallant, 2013). In the present study, two models contain mainly latent variables: model 1 includes 6 latent variables (5 variables under fear of losing SEW endowment, and 1 variable in innovativeness); model 2 contains 10 latent variables (6 variables in market resources, 3 variables in family idiosyncratic resources, and 1 variable under family owners' willingness to pursue radical innovation). Secondly, researchers can conduct CFA and path analysis in the process of model specification and identification in SEM modelling (Kline, 2016). Specifically, CFA represents a more rigorous test of the data than EFA and more analysis of the linkage between indicators and constructs, and variances among latent constructs than EFA (Kelloway, 2015). SEM is convenient for researchers to frame precise questions under certain phenomena (Schumacker & Lomax, 2016). This section will introduce the definition of confirmatory factor analysis (CFA), followed by the criteria of identifying the model fit.

4.6.3.1 CONFIRMATORY FACTOR ANALYSIS

Confirmatory factor analysis (CFA) is used to test whether the relationship between observed variables and the underlying construct exists (Kelloway, 2016). Namely, CFA is to examine if a hypothesis of the testing model follows the underlying theory specified by the researcher (Kelloway, 2016).

To conduct CFA, researchers should ensure the following: first, each factor contains at least three observed items within a model (Kelloway, 2015), and second, a 'large' sample that the model could fit in to. According to Lee and Song (2004), sample size should be large enough to result in better parameter estimation (e.g. factor loading, variance and residual) which is important to determine the accurate measure of CFA (Kline, 2016). When sample size is small (namely less than 100), a non-convergent solution can occur (Hair et al., 2006). Generally, the sample size is expected to exceed at least 100, and a sample size which contains over 300 responses could be identified as adequate for testing a complex model (Kline, 2005). Based on the criteria above, CFA could be tested as the sample responses for the current study exceeds 400.

4.6.3.2 ASSESSING THE MODEL FIT

Model fit statistics are to examine whether the testing model fits the collected data in order to show the power of the analysis in SEM (Kline, 2016). Sometimes, the model shows the poor fit of the data that suggests researchers reject the model. Generally, various fit statistics are described in SEM, which demonstrates the difficulties for researchers to choose to report.

Researchers can rely on absolute fit indices and comparative fit indices to assess the fit of a proposed model. Absolute fit indices are to check whether a model can reproduce an actual covariance matrix. To assess absolute fit, researchers can use chi-square statistics to evaluate the discrepancy between observed sample covariance and reproduced covariance within a proposed model (Hu & Bentler, 1998). In other words, the chi-square statistic (χ^2) is to examine the difference between the null model and the proposed model. If the value produced within chi-square statistics is significant, it shows two models are different showing the data does poorly fit the current model. On the other hand, if the Chi-square statistic is not significant, it then shows that the null model and proposal model have no differences such that the data can fit the testing model (Bagozzi & Heatherton, 1994).

However, the Chi-square statistic value can also be significant when the sample is either too large or too small (Kelloway, 2015). In this circumstance, it is inadvisable that researchers make the conclusion to reject a testing model after receiving poor results from a single measure because the values of fit statistics from a single measure can only show the average fit (e.g. Chi-square statistics only) (Kline, 2016). Researchers can bring the results from other fit indices to draw the final model fit conclusion (Kline, 2016). Table 10 shows the overall model fit criteria which were constructed based on Hu and Bentler's (1999) study. The detail of the systematic procedures of reporting the results of fit statistics will be explained in detail in Section 5.5.4.5.1.

TABLE 10: ASSESSMENT OF OVERALL MODEL FIT CRITERIA

Index	Ideal Values
Chi-Square Statistic	Represents the differences between the null and the proposed model. The preferable number is between .8 and 1, which is not significant.
Root mean squared error of approximation (RMSEA)	Poor fit >.1 Acceptable fit< .1 Moderate fit< .08 Good fit < .05
Standardised root mean square residual (SRMSR)	It ranges between 0 and 1. 0 denotes perfect fit. Less than .8 is recommended. Less than .5 is accepted
The goodness of Fit (GFI)	It ranges between 0 and 1, with more than .9 is defined as an acceptable fit
Comparative Fit (CFI)	It runs a comparison between the theoretical model and baseline model, indicating the current model is better than the model which have no relationship among variables. It ranges between 0 and 1, with over .9 is viewed as an acceptable fit, and over .95 is defined as a good fit.
Non-Normed Fit (NNFI)/Tucker-Lewis (TFI)	>.9 acceptable fit >.95 good fit

Reasons for the poor fit
(1) Model specification errors
(2) Violations of assumptions
(3) Sample size sensitivity (too large/small)

4.6.4 CONVERGENT VALIDITY AND DISCRIMINANT VALIDITY

Convergent validity assesses how close the constructs of the current study are related to theoretical constructs (Blunch, 2013). To ensure the convergent validity of a set of measures, this study will assess the t-value which resulted from the ratio of factor loadings between observed variables and their relevant factors to related standard errors (Koufteros, 1999). The t-value is expected to be large, which represents the high convergent validity within a factor structure (Koufteros, 1999).

On the other hand, discriminant validity is derived from when a selected construct is different from others within a model (Blunch, 2013). To assess discriminant validity, researchers can compare the Average Variance Extracted (AVE) with squared correlations among constructs while running CFA analysis (Blunch, 2013).

4.7 CONCLUSION

This chapter has outlined the research method regarding philosophical positioning which guided the choice of methodological thinking for model 1 and model 2. The quantitative method was later selected that encouraged the researcher to spend time collecting data in Chongqing which is identified as a favourable context for robust investigation for family firm innovation under family manufacturing SMEs. Through the mixed-mode data collection

methods (combination of email survey and online survey), and efforts from Chongqing Chamber of Commerce, the research reached the responses rate of 32% out of 706 private manufacturing SMEs, with 412 responses from family manufacturing SMEs.

The next chapter will first introduce the main software (AMOS and SPSS) used to conduct SEM. Moreover, further data analysis procedures would be divided into two stages. Stage 1 will concern factor analysis to ensure the constructs are reliable and valid. Stage 2 will then test the hypotheses within both model 1 and 2 by using SEM as the main tool. Lastly, the criteria for assessing the testing results will be placed accompanied by the relevant sections.

CHAPTER 5

DATA ANALYSIS AND RESULTS

5.1 INTRODUCTION

This chapter will detail the data analysis procedures and strategies for the two projects. First, it will conduct a descriptive statistical analysis of the sample, comparing the responses between the first and second respondents of a firm, and then check for non-responses bias for the overall study (model 1 and model 2) (Section 5.4). Second, the analysis will be separated into two parts, model 1 and model 2, following the structure of data screening (outliers' identification, multicollinearity analysis and effective sample size testing), model specification (EFA and reliability testing), model identification (CFA, degree of freedom calculation, convergent validity, and discriminant validity), and parameter estimation and presentation of SEM results. This study will use SPSS 22 and AMOS 22 as the analytical tool to conduct an SEM analysis for the hypotheses within both model 1 and model 2. The results of the hypotheses for each model will be presented separately at the end of each model section.

5.2 DESCRIPTIVE STATISTICS OF THE DATA

Within the current sample (see Table 11 below), the majority of the firm size is located in the 9 – 120 range (between 9 and 60 employees (N=225) which occupies 55% of the total sample, and between 61 and 120 employees (N=135) holds 33% of the total sample), totalling 88% of the total number.

In addition, 383 responses were donated by family managers that have occupied 95% of the total answers. Although the other 29 responses are denoted by non-family managers, those responses could merge with the responses of family managers because all non-family respondents are positioned in middle and high management team, and therefore have an appropriate degree of knowledge of the firms.

TABLE 11: SAMPLE DESCRIPTION

Firm Characteristics		N=412	%	Mean	SD
Firm size	Between 9 and 60	225	.55	72.96	60.8
	Between 61 and 120	135	.33		
	Between 121 and 200	37	.09		
	Between 201 and 300	8	.02		
	>300	7	.02		
Firm age (years)	>40 years	10	.02	19.65	9.64
	Between 20 and 40 years	207	.50		
	Between 10 and 19 years	137	.33		
	< 10 years	58	.14		
Family / non-family managers	Family managers	383	.93	1.07	.26
	Non-family managers	29	.07		
Firm experience	Between 1 and 10	141	.34	15.94	8.7
	Between 11 and 20	145	.35		
	Between 21 and 30	112	.27		
	Between 31 and 40	14	.03		
Owners' ambition	Expanding current business	154	.37	1.63	.48
	Maintaining operational consistency	258	.63		

5.3 COMPARING THE DIFFERENCES BETWEEN TWO RESPONSES WITHIN FIRMS

According to the method Section 4.4.5, there were two respondents (family managers or non-family managers in the middle or high management teams) asked to provide responses per each firm in order to verify the degree of the informational authenticity. Then, the analysis divides the two responses into two groups by coding them with the first respondent and second respondent respectively and then comparing the responses by an independent sample t-test. The results of this test are shown in Table 12.

TABLE 12: COMPARING THE DIFFERENCES BETWEEN THE FIRST AND THE SECOND RESPONDENTS

Variables	F	Sig	t	df	sig. (2-tailed)	Mean difference
Size	0.037	0.847	-0.05	410	0.96	-0.301
Firm age	0.002	0.965	0.066	410	0.947	0.063
Human capital	0.069	0.793	0.006	410	0.995	0.015
Family identity	0.03	0.862	-0.588	410	0.557	-0.087
patient capital	0.027	0.87	-1.884	410	0.06	-0.272
Innovativeness	0.57	0.451	-1.525	410	0.128	-0.252

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

Since the t-test of each variable has met the equal variances assumed level (the p-value of the F test is higher than .05, which is not significant), the upper t-test results will be selected to report. According to Table 12, there are no statistically significant differences between the responses from the first respondent and second respondent because of the significant. (2-tailed) values are higher than .05.

5.4 NON-RESPONSE BIAS

As explained in Section 4.6.1, non-response bias test examines whether the current responses and the responses which are not received or late are statistically significantly different from each other. If these two responses are statistically significantly different ($p<.05$), the null hypothesis will be rejected, and it demonstrates the responses are biased that has low representability of the sample and generalisability towards a population (Bryman, 2008).

The analysis required randomly selecting two groups (50 firms from early responses and 50 firms from late responses) to compare responses regarding the firm size, family employees, and radical innovation education, fear of losing family control, technological resources, radical innovation intensity, innovativeness and fear of losing family identity through an independent sample t-test in the SPSS software (Morgan et al., 2003). The results show the p-values of the 6 selected variables are above .05 (shown in Table 13). The null hypothesis can be accepted since there are no statistically significant differences between early responses and late responses and proving there is no non-response bias within the current sample.

TABLE 13: RESULTS OF NON-RESPONSE BIAS

Variables	F	t	df	Sig. (2-tailed)	Mean Difference
Size	.198	.839	97	.403	13.23592
Family Employees	3.564	1.144	97	.256	1.16122
Radical Innovation Education	.035	.147	97	.883	.03184
Fear of Losing Family Control	3.679	-.984	97	.328	-.40653
Technological Resource	1.878	-.815	97	.417	-.31388
Radical Innovation Intensity	2.647	.824	97	.412	6.99143
Innovativeness	.589	-.822	97	.413	-.31082
Fear of Losing Family Identity	.67	-.463	97	.644	-.1701

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

5.5 MODEL 1: FEAR OF LOSING SEW DIMENSIONS AND FIRM INNOVATIVENESS

This section includes three parts. The first part entails data screening regarding multivariate normality, multicollinearity, testing of the effectiveness of the sample. The second and third parts will include EFA and reliability testing and CFA testing. The SEM results will be presented at the end of this chapter, which is Section 5.5.5.

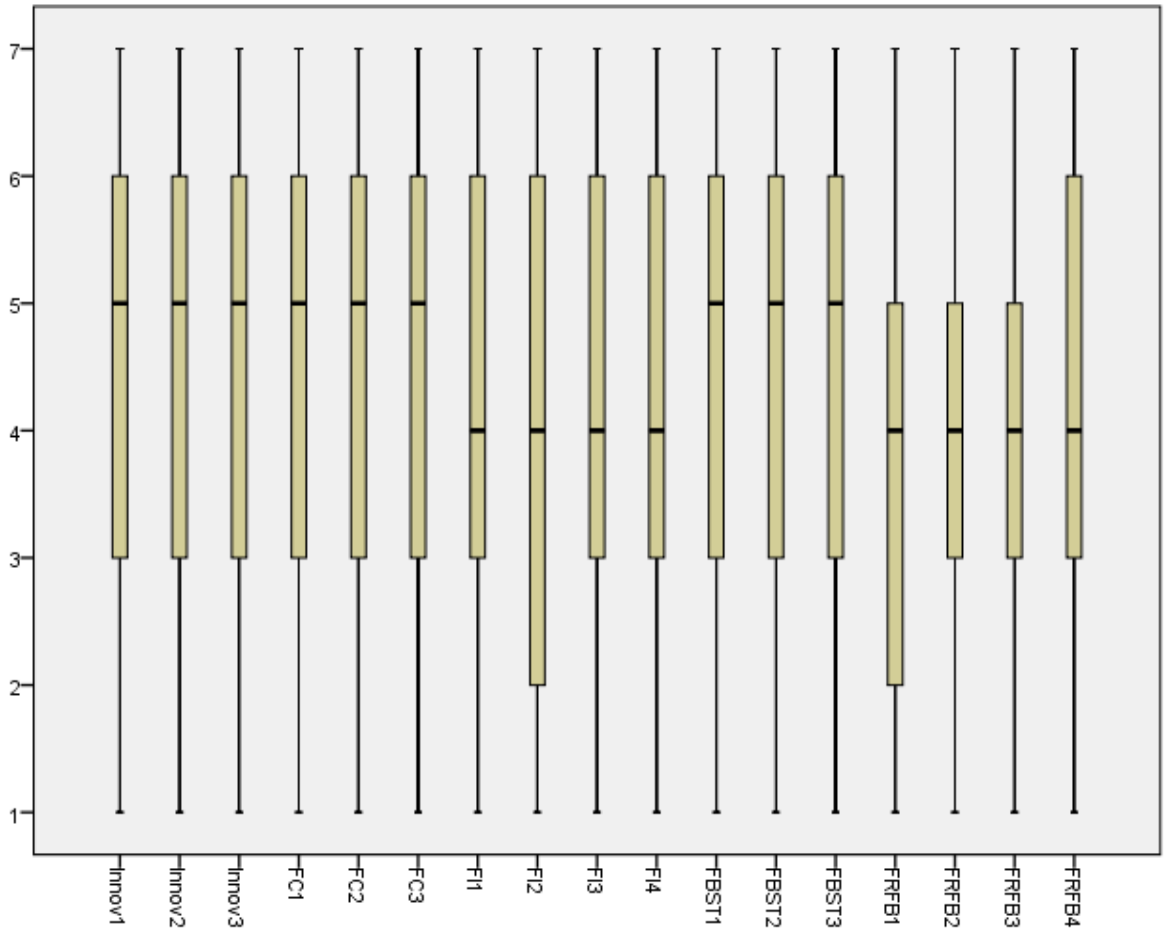
5.5.1 DATA SCREENING

5.5.1.1 SAMPLE SIZE AND OUTLIERS

As the minimum sample size for SEM is 200 (Diamantopoulos, 2011), the current sample size is adequate for conducting SEM (N=412). Indeed, the more complex the model, the more parameters will be generated, and the larger the sample will be required (Kline, 2016). Model 1 contains 6 latent variables (5 independent variables and 1 dependent variable) with 17 observed variables. Based on the calculation of Wolf et al. (2013), the minimum sample size should be 146. Therefore, the sample size for this study is adequate for SEM.

Detecting the outliers of each testing variable within a model is important because sometimes outliers can severely influence the validity of the tests (Blunch, 2013). For instance, outliers can increase the degree of skewness and kurtosis of variables that will further inflate or deflate variance-covariance reproduction. Attending to outliers is necessary to enhance the model power (Gao et al., 2008). The outliers have been screened by studying the histograms of all the observed variables within model 1 (shown in Figure 5) (Blunch, 2013). Figure 5 shows there are no extreme cases in this study. Therefore, it is decided to retain all cases.

FIGURE 5: HISTOGRAMS OF ALL VARIABLES WITHIN MODEL 1



Innov = firm innovativeness
FC = Fear of losing family control and influence
FI = Fear of losing family identity
FBST= Fear of losing family binding social ties
FRFB = Fear of losing family renewal of family bonds

5.5.1.2 MULTICOLLINEARITY

Multicollinearity entails two or more independent variables combined together that can cause a singularity in prediction between the independent variable and the dependent variable (Pallant, 2013). According to Hair et al. (2006) and Pallant (2013), multicollinearity could be presented if the tolerance results are less than .1 and VIF results are higher than 9 from collinearity statistics. In Table 14, there is no statistical result staying out of these critical boundaries. Thus, it demonstrates there is no multicollinearity among the variables within model 1.

5.5.1.3 MISSING VALUES AND NORMALITY

To avoid missing value among the survey responses, the online questionnaires were constructed as force responses such that the whole survey responses could not be uploaded

onto the Qualtrics system if there was a single incomplete or missing response by a respondent. After conducting a frequency test, there are no missing values among the variables in model 1 (shown in the Valid Cases column in Table 14).

According to Blunch (2013), severe non-normality (both univariate normality and multivariate normality) can cause bias among parameter estimation, test results and fit measures while conducting SEM. For instance, non-normality might cause invalid test results (e.g. inflated or deflated variance, covariance results, or correlation results), which can impede the conducting of multivariate analysis (Srivastava, 2002). Therefore, it is necessary to check whether the test variables are normally or non-normally distributed.

The variables' normalities can be initially examined by Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW) statistics, which examine whether there are statistically significant differences between the distribution of the current variable and the normal distribution. When the p-value is less than .05 in both KS and SW statistics, it will reject the null hypothesis which indicates there are statistically significant differences between the current variable distribution and the normal distribution.

In Table 14 which is listed below, the KS and SW measures for all variables have met the significant level ($p<.05$), demonstrating all values within the variables have different degrees of left and right skewness, and flat and peak kurtosis (identified by '+' and '-' within the values of skewness and kurtosis measures respectively). According to Pallant (2013), the variable is perfectly normally distributed when the skewness or kurtosis ratio equals zero. For instance, the stronger the variable is skewed, the larger the ratio (in absolute value terms) will be generated from the normality test.

Indeed, it is rare to see variables which are normally distributed in a large dataset when researchers have adopted KS and SW statistics as the reference of normality (Schumacker & Lomax, 2016). Gao et al. (2008) and Kim (2013) argued that there is a way to identify the normality of variables when variables have met the significant level ($p<.05$) in Kolmogorov-Smirnov and Shapiro-Wilk statistics – calculating the Z-score though dividing skewness (or kurtosis) ratio by its standard error (SE). When Z-score stays in the range between -1.96 and +1.96, it illustrates the values within a variable are normally distributed. Otherwise, the variables are non-normally distributed.

$$Z\ skewness = \frac{Skewness\ measure}{Skewness\ measure\ SE}$$

$$Z\ Kurtosis = \frac{Kurtosis\ measure}{Kurtosis\ measure\ SE}$$

The Z-statistics for both skewness and kurtosis have been calculated based on the formulas specified above. However, around 8 Z skewness ratios and all Z kurtosis ratios exceed the $\pm$1.96 range in Table 14, showing that these variables are non-normally distributed. One of the reasons for causing non-normality of these variables is the standard error can be low in a large dataset (N>200), which would render large Z scores within the formulae described above (Cain et al., 2017).

Because it is difficult to find values which are perfectly distributed in a normal way within a large dataset (N>200) (Cain et al., 2017), Tabachnick and Fidell (2001) suggest that non-normality of variable/variables will result in a substantial impact on the regression results when the sample size is small (between 30 and 50). When the sample size is over 200, however, the regression results (when the variables are non-normally distributed) will be less likely to deviate from the regression results within which the variables are normally distributed. Therefore, it is not necessary to follow the critical criteria of identifying normality of variables in model 1 for the coming EFA and CFA (Blunch, 2013).

TABLE 14: COLLINEARITY AND DESCRIPTIVE STATISTICS

Variables	Items	Tolerance	VIF	Valid Cases	Mean	Variance	Skewness	Kurtosis	Z Skewness	Z Kurtosis
Innovativeness	Innov1	.311	3.215	412	4.41	3.727	-.181	-1.315	-1.504	**-5.480**
	Innov2	.218	4.592	412	4.64	3.248	-.324	-1.081	**-2.691**	**-4.505**
	Innov3	.236	4.241	412	4.71	2.847	-.405	-.894	**-3.364**	**-3.727**
Fear of losing family control and influence	FC1	.166	6.007	412	4.49	3.954	-.403	-1.201	**-3.349**	**-5.005**
	FC2	.167	5.974	412	4.34	3.886	-.340	-1.215	**-2.825**	**-5.063**
	FC3	.153	6.515	412	4.41	3.483	-.412	-1.137	**-3.426**	**-4.739**
Fear of losing family identity	FI1	.204	4.907	412	4.04	3.351	-.019	-1.195	-.161	**-4.983**
	FI2	.164	6.116	412	3.96	3.305	.062	-1.207	.512	**-5.032**
	FI3	.161	6.229	412	4.07	3.313	.013	-1.205	.109	**-5.023**
	FI4	.196	5.093	412	4.01	3.333	.022	-1.180	.181	**-4.917**
Fear of losing binding social ties	FBST1	.259	3.865	412	4.53	3.345	-.454	-.955	**-3.773**	**-3.981**
	FBST2	.209	4.790	412	4.73	3.217	-.575	-.832	**-4.782**	**-3.468**
	FBST3	.215	4.650	412	4.54	2.988	-.501	-.803	**-4.170**	**-3.346**
Fear of losing renewal of family bonds	FRFB1	.272	3.676	412	3.83	3.171	.144	-1.060	1.194	**-4.418**
	FRFB2	.275	3.637	412	3.90	3.189	.145	-1.049	1.206	**-4.371**
	FRFB3	.174	5.743	412	3.88	3.025	.134	-.954	1.110	**-3.976**
	FRFB4	.270	3.699	412	4.23	3.113	-.251	-.976	**-2.086**	**-4.068**

5.5.2 EFA RESULTS FOR MODEL 1

This section will report the results of exploratory factor analysis (EFA) conducted to verify whether the observed variables share the same underlying domain, which follows the theoretical implications in Chapter 3 (see Section 3.2). At the beginning, the EFA test uses principal components analysis to apply to all the observed variables relating to the independent constructs, with direct oblimin rotation approach (as the measures of the fear of losing SEW are under the umbrella of fear of losing SEW, the covariance between SEW dimensions is highly likely in which varimax rotation, assuming zero covariance among factors, is inappropriate). Thereafter, EFA will be conducted for each construct to ensure that there is no underlying multidimensional structure.

5.5.2.1 EFA RESULTS: FEAR OF LOSING SEW

TABLE 15: EFA RESULTS OF FEAR OF LOSING SEW

Variables	Construct Measures	Factor 1	Factor 2	Commonalities
Fear of losing family control and influence	I)That the majority of shares in the family business will not be owned by family members in the future	.	.857	.826
	II)That most executive positions will not be occupied by family members in the future		.817	.811
	III)That the board of directors will not be mainly composed of family members in the future		.851	.831
Fear of losing family identity	I)That family members will unlikely to have a strong sense of belonging to the firm in the future	.755		.77
	II)That family members will unlikely feel that the family business success is their own success	.822		.793
	III)That being a family member of the family business will unlikely help define who we are	.794		.759
	IV)That family members will unlikely be proud of telling others that we are part of the family business in the future	.813		.779
Fear of losing family binding social ties	I)That non-family employees will unlikely to be treated as part of the family in the future		.781	.754
	II)That the contractual relationships will unlikely be mainly based on trust and norms of reciprocity in the future		.846	.792
	III)That building strong relationships with other institutions (i.e. other companies, professional associations, government agents) will unlikely be important for the family business		.809	.753

Fear of losing renewal of family bonds	I)That the continuing the family legacy and tradition will unlikely be an important goal for the family business in the future	.818		.734
	II)That we will likely consider selling the family business in the future	.820		.733
	III)That successful business transfer to the next generation will unlikely be important goals for the family business	.83		.783
	IV)That preservation of family control and independence will unlikely be important goals for the family business	.763		.678
	Eigenvalues	9.189	1.607	
	Cumulative Percentage of Total Variance	40.674%	77.116%	
KMO and Bartlett's Test				
Kaiser-Meyer-Olkin Measure = .993				
Bartlett's Test of Sphericity (Approx. Chi-Square=6565.424; df=91; sig.=.000)				

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

Because the fear of losing emotional attachment factor is heavily cross-loaded to other factors during the EFA, fear of losing emotion was then removed.

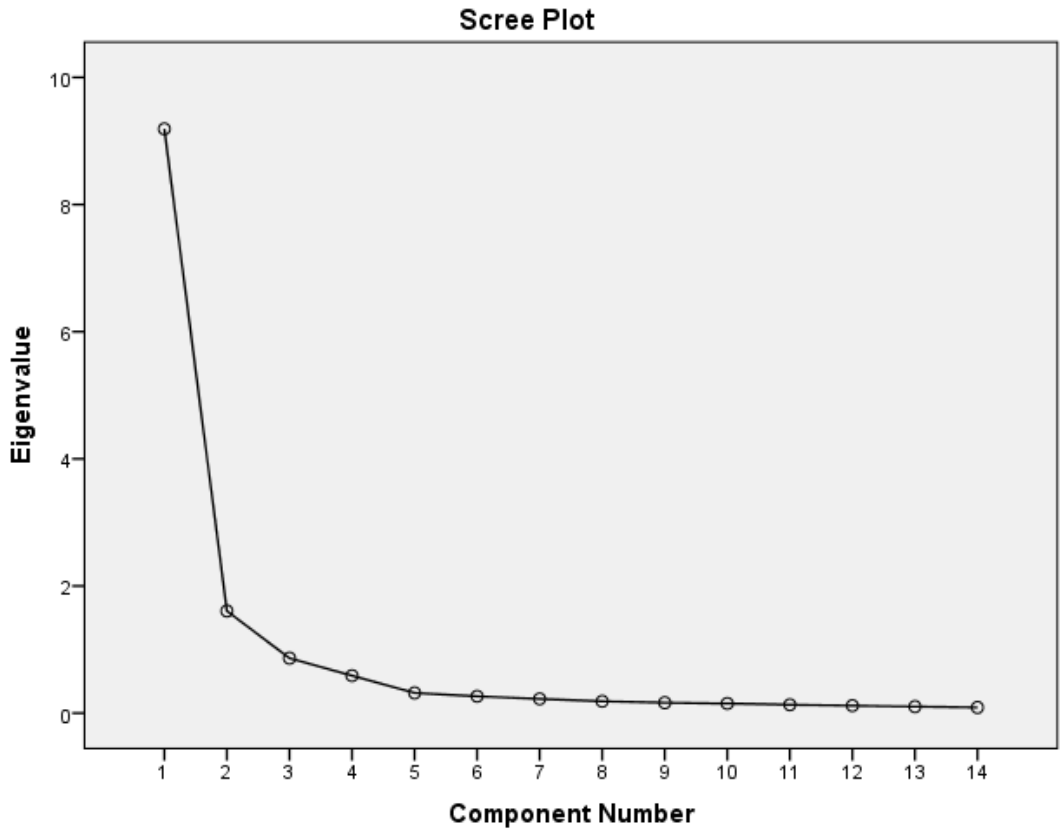
The EFA has verified the items within the measure of fear of losing SEW dimensions (Table 15). First, the KMO and Bartlett's test results are shown at the top of Table 15. Kaiser-Meyer-Olkin (KMO) statistic is used to measure the data's suitability for factor analysis through viewing the proportion of variance among variables caused by underlying factors (Blunch, 2013). The KMO values are located between 0 and 1. The more the KMO value is close to 1, the larger the proportion of variances among the testing variables can be explained by the underlying factors (Pallant, 2013). Based on the rule of thumb, the KMO value should not be less than .6 (Blunch, 2013). The results show the KMO is .933 which is larger than the threshold of .6, demonstrating the testing variables are largely explained by the underlying factors.

In addition, to justify the application of factor analysis, the data matrix should have sufficient correlations among variables (greater than the threshold .3) (Hair et al., 2006). In EFA, correlation status among the testing variables is shown in Bartlett's test of sphericity statistics (Hair et al., 2010; Blunch, 2013). According to Blunch (2013), when Bartlett's test of sphericity is significant ($p<.05$), it illustrates the correlation matrix has a significant correlation among some of the variables that can further demonstrate the factor analysis is appropriate. In the current study, the factor analysis is appropriate because Bartlett's test of sphericity is at a significant level ($p<.001$).

Second, the principle components analysis demonstrates 2 components (9.189 and 1.607) were extracted, with eigenvalue exceeding 1, capturing 77.116% of total variances. Based

on Kaiser's eigenvalue-greater-than-one rule, the two components from the principle components analysis are retained (Ledesma & Valero-Mora, 2007). In addition, the factor loadings are presented at the extracted factor columns, all the factor loadings exceeded .755, which exceeded the threshold of .4; and the communalities values have shown a high percentage of shared (common) variance (over 67.8%) which exceed the threshold of .3 (Hosany et al., 2006) (Table 15).

FIGURE 6: SCREE PLOT OF FEAR OF LOSING SEW



However, based on the scree test criterion, the cut-point is located at the junction cross between steeply a downward line and horizontal line ('elbow' point) (Pallant, 2013), and the factors, which start from the 'elbow' point towards the righthand side, would be identified as non-significant factors (Blunch, 2013). Figure 6 presents the break between 4 and 5, showing 4 factors are significant.

5.5.2.2 EFA RESULTS: FEAR OF LOSING FAMILY CONTROL AND INFLUENCE

TABLE 16: EFA RESULTS: FEAR OF LOSING FAMILY CONTROL AND INFLUENCE

Variables and Measures		Factor Loading	Communalities
FC1 That the majority of shares in the family business will not be owned by family members in the future		.958	.918
FC2 That most executive positions will not be occupied by family members in the future		.957	.915
FC3 That the board of directors will not be mainly composed of family members in the future		.955	.912
Total variance extracted**:** Extraction sums of squared loadings			
Component	Total	% of Variance	Cumulative %
1	2.745	91.503	91.503
KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure = .778			
Bartlett's Test of Sphericity (Approx. Chi-Square=1273.163; df=3; sig.=.000)			

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

The EFA verifies the items within the measure of fear of losing family control and influence (FC1, FC2 and FC3) (Table 16). On the one hand, the results show the KMO is .778 which is larger than the threshold of .6; on the other hand, Bartlett's test of sphericity is at the significant level (p<.001), indicating the correlation matrix has significant correlations among the testing variables. According to Blunch (2013), when Bartlett's test of sphericity is significant (p<.001), it illustrates the database is suitable for factor analysis.

FIGURE 7: SCREE PLOT OF FEAR OF LOSING FAMILY CONTROL AND INFLUENCE

Principle components analysis demonstrates 1 component with eigenvalue exceeding 1, capturing 91.5% of total variances. There is also a clear break after the first point showing in the scree plot (Figure 7). Finally, all the factor loadings exceeded .9; and the communalities values have shown a high percentage of shared (common) variance (over 90%) which exceed the threshold of .3 (Hosany et al., 2006) (Table 16).

5.5.2.3 EFA RESULTS: FEAR OF LOSING FAMILY IDENTITY

TABLE 17: EFA RESULTS: FEAR OF LOSING FAMILY IDENTITY

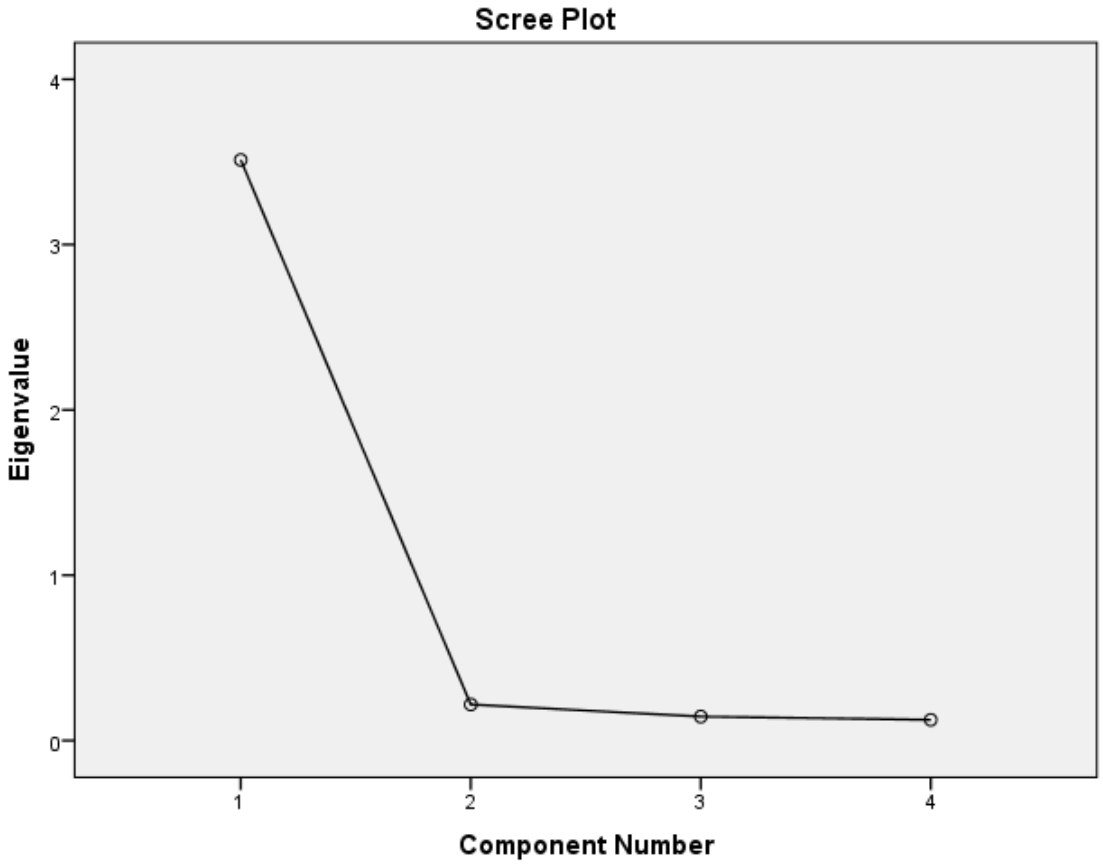
Variables and Measures	Factor Loading	Communalities
FI1 That family members will unlikely to have a strong sense of belonging to the firm in the future	.926	.857
FI2 That family members will unlikely feel that the family business success is their own success	.943	.890
FI3 That being a family member of the family business will unlikely help define who we are	.946	.895
FI4 That family members will unlikely be proud of telling others that we are part of the family business in the future	.933	.870
Total variance extracted: Extraction sums of squared loadings		
Component	Total	% of Variance	Cumulative %
1	3.512	87.801	87.801
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure = .861		
Bartlett's Test of Sphericity (Approx. Chi-Square=1178.520; df=6; sig.=.000)		

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

EFA has verified the items from FI1 to FI4, which measured the fear of losing family identity to ensure these items are from the intended construct. The results show .861 in KMO statistics and Bartlett's test were at a significant level (p<.001). It shows that dataset is suitable for EFA (Table 17).

Based on principal components analysis, the underlying structure of the fear of losing family identity measure is unidimensional because there is only 1 component's eigenvalue exceeding 1, explaining 87.801% of total variances. The factor extraction has been provided in the scree plot regarding there is a clear break after the first point (Figure 8).

FIGURE 8: SCREE PLOT OF FEAR OF LOSING FAMILY IDENTITY



All the factor loadings exceed .9, and the least percentage of shared (common) variance is 85.7% within communalities values.

5.5.2.4 EFA RESULTS: FEAR OF LOSING FAMILY BINDING SOCIAL TIES

TABLE 18: EFA RESULTS: FEAR OF LOSING FAMILY BINDING SOCIAL TIES

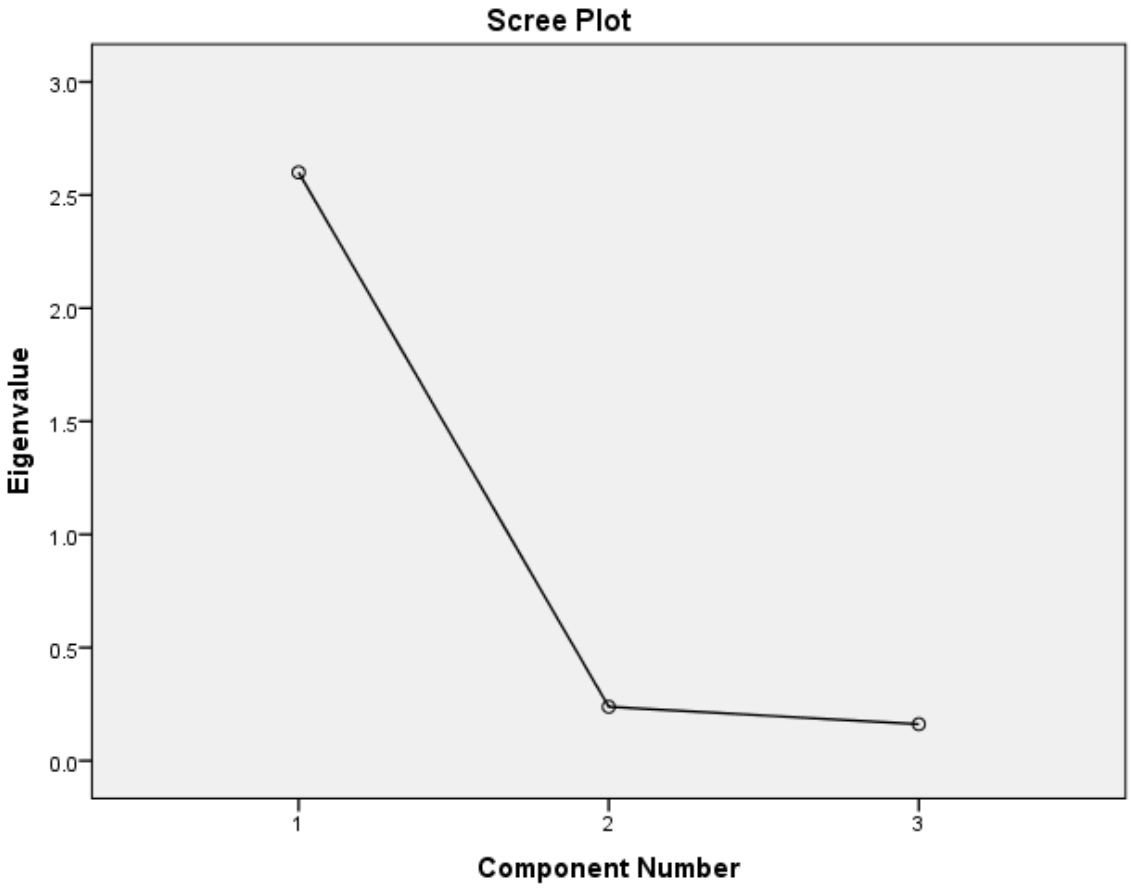
Variables and Measures	Factor Loading	Communalities
FBST1 That nonfamily employees will unlikely be treated as part of the family in the future	.918	.843
FBST2 That the contractual relationships will unlikely be mainly based on trust and norms of reciprocity in the future	.944	.891
FBST3 That building strong relationships with other institutions (i.e. other companies, professional associations, government agents) will unlikely be important for the family business	.93	.866
Total variance extracted: Extraction sums of squared loadings		
Component	Total	% of Variance	Cumulative %
1	2.6	86.674	86.674
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure = .755		
Bartlett's Test of Sphericity (Approx. Chi-Square=941.955; df=3; sig.=.000)		

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

EFA has verified the Items from FBST1 to FBST3, which were intended to measure the fear of losing family binding social ties, indeed form the intended construct. The results show .755 in KMO statistics and Bartlett's test were at a significant level (p<.001). It shows that dataset is suitable for EFA (Table 18).

Based on principal components analysis, the underlying structure of the fear of losing family identity measure is unidimensional because there is only 1 component's eigenvalue exceeding 1, explaining 86.674% of total variances. The factor extraction has been provided in the scree plot regarding there is a clear break after the first point (Figure 9).

FIGURE 9: SCREE PLOT OF FEAR OF LOSING FAMILY BINDING SOCIAL TIES



All the factor loadings exceed .9, and the least percentage of shared (common) variance is 84.3% within communalities values.

5.5.2.5 EFA RESULTS: FEAR OF LOSING RENEWAL OF FAMILY BONDS

TABLE 19: EFA RESULTS: FEAR OF LOSING RENEWAL OF FAMILY BONDS

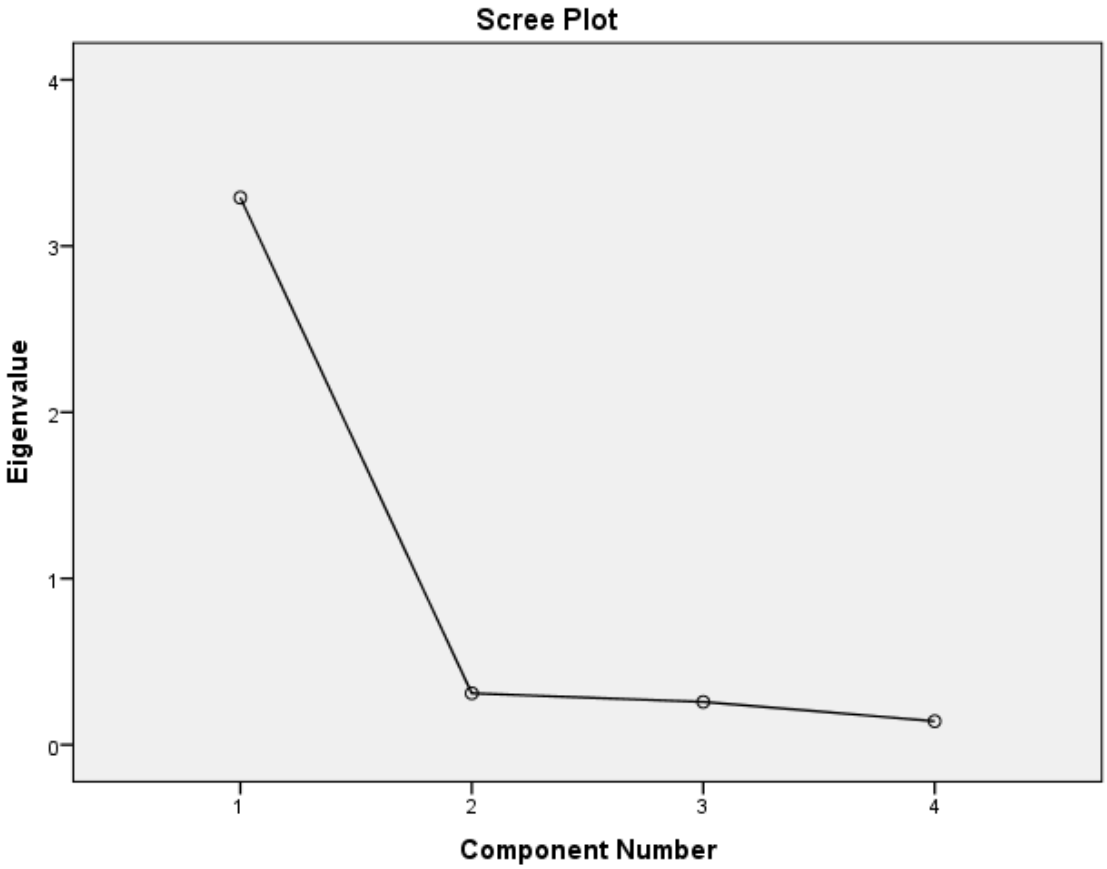
Variables and Measures	Factor Loading	Communalities
FRFB1 That strong emotional ties among family members will unlikely help us maintain a positive self-concept in the future	.896	.804
FRFB2 That the continuing the family legacy and tradition will unlikely be an important goal for the family business in the future	.902	.813
FRFB3 That we will likely consider selling the family business in the future	.947	.896
FRFB4 That successful business transfer to the next generation will unlikely be important goals for the family business	.882	.778
Total variance extracted: Extraction sums of squared loadings		
Component	Total	% of Variance	Cumulative %
1	3.291	82.273	82.273
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure = .846		
Bartlett's Test of Sphericity (Approx. Chi-Square=1345.129; df=6; sig.=.000)		

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

EFA has verified the Items from FRFB1 to FRFB4, which were intended to measure the fear of losing renewal of family bonds, indeed form the intended construct. The results demonstrate .846 in KMO statistics and Bartlett's test were at a significant level (p<.001). These show that the dataset is suitable for EFA (Table 19).

Based on principal components analysis, the underlying structure of the fear of losing family identity measure is unidimensional because there is only 1 component's eigenvalue exceeding 1, explaining 82.273% of total variances. The factor extraction has been provided in the scree plot regarding there is a clear break after the first point (Figure 10).

FIGURE 10: SCREE PLOT OF FEAR OF LOSING RENEWAL OF FAMILY BONDS



All the factor loadings exceed .88, and the least percentage of shared (common) variance is 77.8% within communalities values.

5.5.2.6 EFA RESULTS: ENVIRONMENTAL DYNAMISM

TABLE 20: EFA RESULTS: ENVIRONMENTAL DYNAMISM

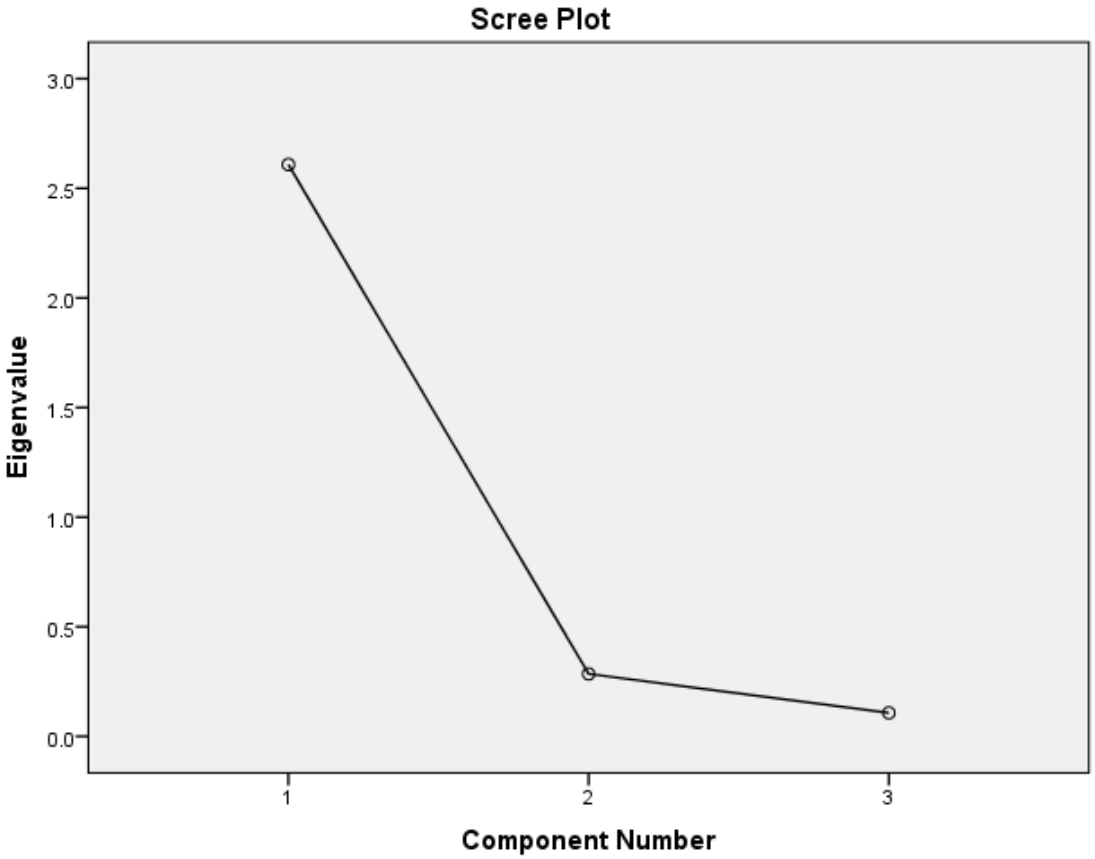
Variables and Measures	Factor Loading	Communalities
EnD 1: In the current market, customers' preferences change quickly over time	.9	.809
EnD 2: Market demand and consumer tastes in your market are unpredictable	.96	.921
EnD 3: Actions of competitors in the market have been highly unpredictable	.937	.878
Total variance extracted: Extraction sums of squared loadings		
Component	Total	% of Variance	Cumulative %
1	2.608	86.940	86.940
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure = .719		
Bartlett's Test of Sphericity (Approx. Chi-Square=1036.249; df=3; sig.=.000)		

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

EFA has verified the Items from EnD1 to EnD3, which were intended to measure the environmental dynamism, indeed form the intended construct. The results show .719 in KMO

and p-value less than .001 in Bartlett's test of sphericity (Table 20). While, there is only 1 component's eigenvalue is greater than 1, explaining 86.94% of the total variance. The factor extraction has been provided in the scree plot regarding there is a clear break after the first point (Figure 11).

FIGURE 11: SCREE PLOT OF ENVIRONMENTAL DYNAMISM



In addition, all the factor loadings exceed .9, and the lowest percentage of shared (common) variances is 80.9%.

5.5.2.7 EFA RESULTS: ENVIRONMENTAL FITNESS

TABLE 21: EFA RESULTS: ENVIRONMENTAL FITNESS

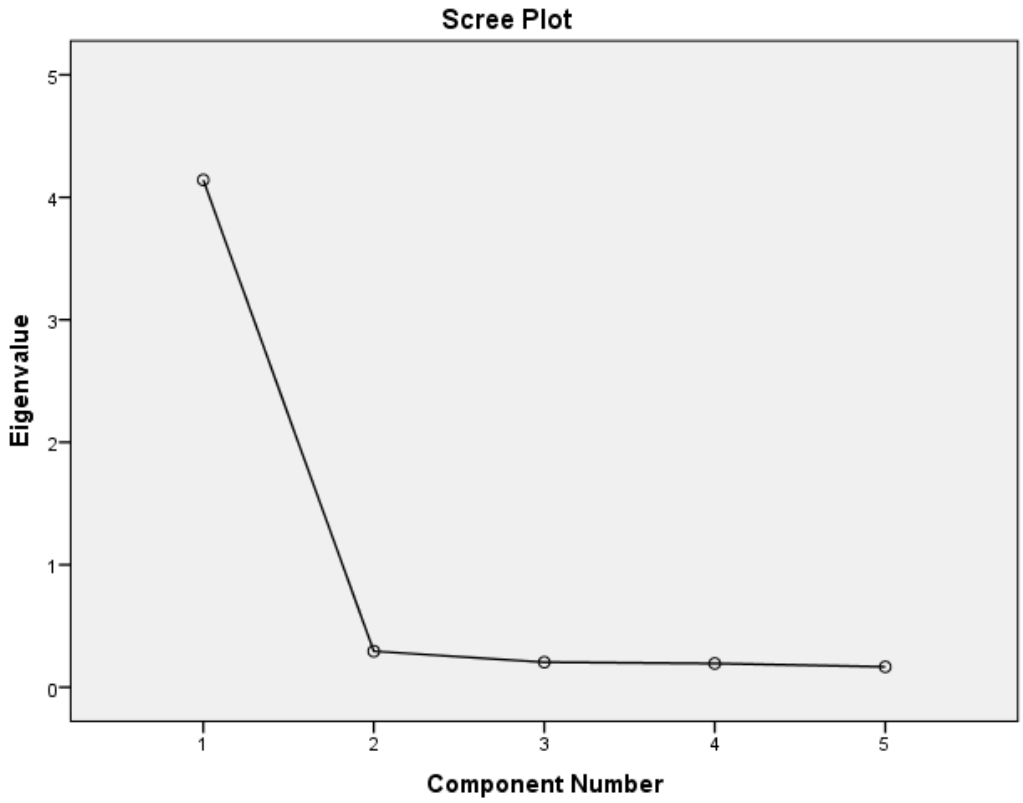
Variables and Measures	Factor Loading	Communalities
EnF1: Based on your knowledge, please rate the degree to which the development speed of a new technological product is within the current industry in general: - Far behind our time goals: Far ahead of our time goals	.889	.790
EnF2: Based on your knowledge, please rate the degree to which the development speed of a new technological product is within the current industry in general: - Slower than industry norm: Faster than industry norm	.921	.847
EnF3: Based on your knowledge, please rate the degree to which the development speed of a new technological product is within the current industry in general: - Much slower than we expected: Much faster than we expected	.908	.824
EnF4: Based on your knowledge, please rate the degree to which the development speed of a new technological product is within the current industry in general: - Behind where we would be had we gone it along: Ahead of where we would be had we gone it alone	.915	.837
EnF5: Based on your knowledge, please rate the degree to which the development speed of a new technological product is within the current industry in general: - Slower than our typical product development time: Faster than our typical product development time	.918	.843
Total variance extracted: Extraction sums of squared loadings		
Component	Total	% of Variance	Cumulative %
1	4.142	82.831	82.831
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure =. 907		
Bartlett's Test of Sphericity (Approx. Chi-Square=1971.378; df=10; sig.=.000)		

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

EFA has verified that the Items from EnF1 to EnF5, which were intended to measure the environmental fitness, indeed form the intended construct. The results show .907 in KMO statistics and Bartlett's test were at a significant level (p<.001) (Table 21).

In addition, based on principal components analysis, the underlying structure of the fear of losing family identity measure is unidimensional because there is only 1 component's eigenvalue exceeding 1, explaining 82.831% of total variances. The factor extraction has been examined in the scree plot regarding there is a clear break after the first point (Figure 12).

FIGURE 12: SCREE PLOT OF ENVIRONMENT FITNESS



All the factor loadings exceeded .889, and the lowest percentage of shared (common) variance is 79% within communalities values.

5.5.2.8 EFA RESULTS: DOMESTIC ENVIRONMENTAL MUNIFICENCE

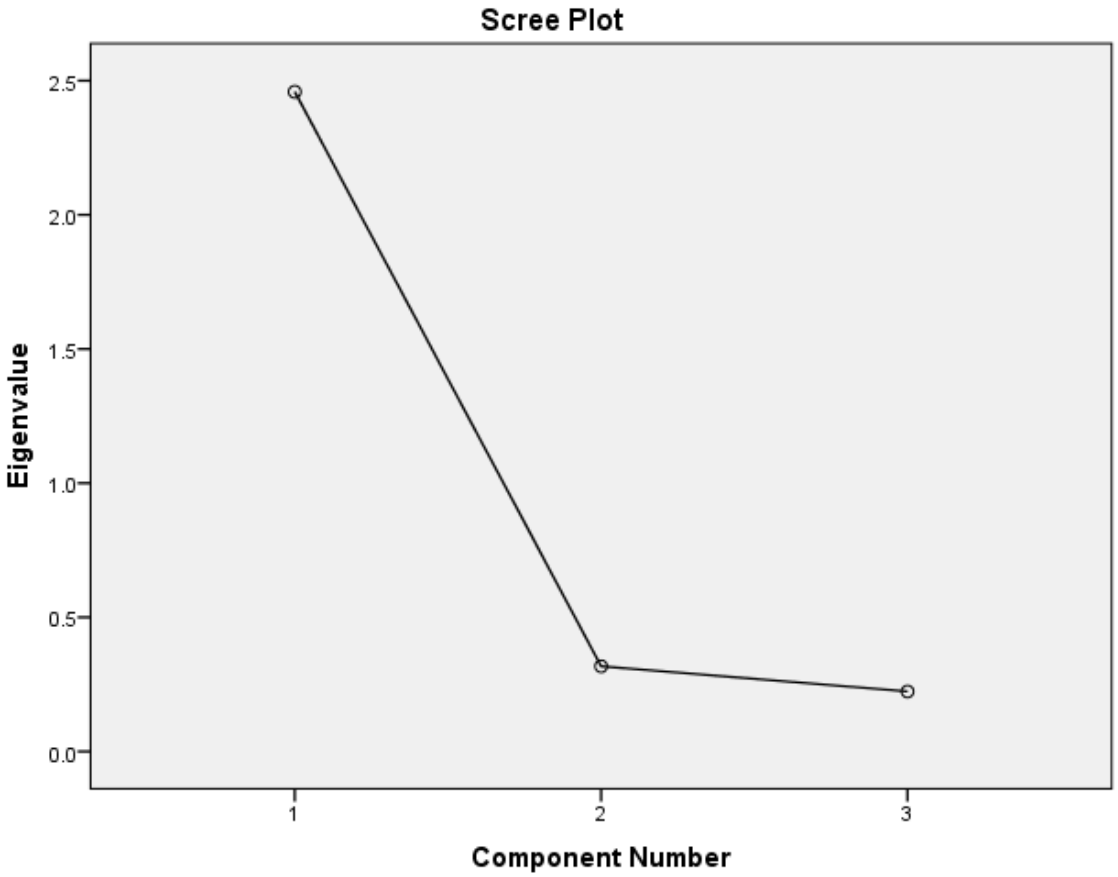
TABLE 22: EFA RESULTS: DOMESTIC ENVIRONMENTAL MUNIFICENCE

Variables and Measures	Factor Loading	Communalities
DoM1: the characteristics of the domestic conditions (in the country where your company's headquarters are located) in the last 3 years - Very risky, a false step can mean our firms' undoing: Very safe, little threat to the survival and well-being of our firm	.901	.811
DoM2: the characteristics of the domestic conditions (in the country where your company's headquarters are located) in the last 3 years – 'free opportunities' – 'abundance of investment opportunities'	.923	.853
DoM3: the characteristics of the domestic conditions (in the country where your company's headquarters are located) in the last 3 years – 'very little against tremendous competitive, political, or technological forces' – 'competitive'.	.891	.794
Total variance extracted: Extraction sums of squared loadings		
Component	Total	% of Variance	Cumulative %
1	2.459	81.955	81.955
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure =. 739		
Bartlett's Test of Sphericity (Approx. Chi-Square=713.822; df=3; sig.=.000)		

Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

EFA has verified the Items from DoM1 to DoM3, which were intended to measure the domestic environmental munificence, indeed form the intended construct. The results demonstrate .739 in KMO and p-value less than .001 in Bartlett's test of sphericity. While, there is only 1 component's eigenvalue is greater than 1, explaining 81.955% of the total variance (Table 22). The factor extraction has been proved in the scree plot regarding there is a clear break after the first point (Figure 13).

FIGURE 13: SCREE PLOT OF DOMESTIC ENVIRONMENTAL



In addition, all the factor loadings have exceeded .9, and the lowest percentage of shared (common) variances is 81.1%.

5.5.3 RELIABILITY ANALYSIS

The reliability analysis of the constructs within model 1 was conducted by viewing the internal consistency of the constructs using the Cronbach alpha coefficient of each construct measured within SPSS. The mechanism of Cronbach's alpha is to create assumptions that a group of multiple items, which are constructed by 7 or 5-point Likert-scales, have measured the same underlying construct (Pallant, 2013). The results of Cronbach's alpha vary between 0 and 1 (Kline, 2016), but the threshold of Cronbach's alpha should be equal or greater than .7 to show a construct has reached the appropriate level regarding the multiple items performed consistently to measure the construct (Nunnally, 1978). Based on the rule of thumb, a Cronbach's alpha of .7 and above indicates an acceptable level of internal consistency among the tested items; .8 and above indicates a good level of internal consistency among the tested items; .9 and above indicates an excellent level of internal

consistency among the items (Tabachnick & Fidell, 2001). The testing results of reliability analysis of model 1 constructs were listed below.

TABLE 23: INTERNAL CONSISTENCY OF ALL THE LATENT CONSTRUCTS WITHIN MODEL 1

N=412				
Constructs	Items	Corrected item-total correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Innovativeness	Innov1	.810	.918	.922
	Innov2	.874	.861	
	Innov3	.849	.885	
Fear of losing family control and influence	FC1	.905	.929	.953
	FC2	.902	.931	
	FC3	.899	.934	
Fear of losing family identity	FI1	.868	.945	.954
	FI2	.898	.936	
	FI3	.902	.935	
	FI4	.880	.941	
Fear of losing family binding social ties	FBST1	.819	.908	.923
	FBST2	.869	.867	
	FBST3	.841	.890	
Fear of losing renewal of family bonds	FRFB1	.814	.911	.928
	FRFB2	.822	.909	
	FRFB3	.899	.884	
	FRFB4	.792	.919	
Environmental dynamism	EnD1	.785	.939	.925
	EnD2	.903	.844	
	EnD3	.854	.885	
Environmental fitness	EnF1	.827	.941	.948
	EnF2	.873	.933	
	EnF3	.853	.937	
	EnF4	.864	.935	
	EnF5	.869	.934	
Domestic environmental munificence	DoM1	.777	.850	.890
	DoM2	.819	.811	
	DoM3	.759	.865	

Note. Acceptable level: Cronbach's Alpha≥.7; non-acceptable level <.7

According to Table 23, 7 measures have shown excellent internal consistency results – Innovativeness (α=.922), fear of losing family control and influence (α=.953), fear of losing family identity (α=.954), fear of losing family binding social ties (α=.923), fear of losing renewal of family bonds (α=.928), environmental dynamism (α=.925), and environmental fitness (α=.948). In addition, the Cronbach's alpha for domestic environmental munificence is .89 showing good internal consistency. All 8 measures are excellent and far above the threshold of .7.

TABLE 24: INTER-ITEM CORRELATION MATRIX OF THE VARIABLES

	INNOV1	INNOV2	FC1	FC2	FI1	FI2	FBST1	FBST2	FRFB1	FRFB2	FRFB3	END1	END2	ENF1	ENF2	ENF3	ENF5	DOM1	DOM2
INNOV1	**1.00**	**.80**																	
INNOV3	**.76**	**.85**																	
FC1			**1.00**	**.88**															
FC3			**.87**	**.87**															
FI1					**1.00**	**.85**													
FI3					**.82**	**.86**													
FI4					**.80**	**.83**													
FBST1							**1.00**	**.80**											
FBST3							**.77**	**.83**											
FRFB1									**1.00**	**.74**	**.81**								
FRFB3									**.81**	**.82**	**1.00**								
FRFB4									**.70**	**.71**	**.80**								
END1												**1.00**	**.79**						
END3												**.73**	**.89**						
ENF1														**1.00**	**.81**	**.73**	**.76**		
ENF3														**.73**	**.79**	**1.00**	**.89**		
ENF4														**.75**	**.78**	**.81**	**.82**		
ENF5														**.76**	**.81**	**.79**	**1.00**		
DOM1																		**1.00**	**.76**
DOM3																		**.68**	**.74**

Innov = firm innovativeness
FC = Fear of losing family control and influence
FI = Fear of losing family identity
FBST= Fear of losing family binding social ties
FRFB = Fear of losing family renewal family bonds
EnD = Environmental dynamism
ENF = Environmental fitness
DoM = Domestic environmental munificence

In addition, corrected item-total correlation results, and internal-item correlation results (Table 24) of all the measuring items have exceeded the corrected item-total correlation threshold (.5) (Kim & Stoel, 2004) and internal-item correlation threshold (.3) (Halkett & Kristjanson, 2007). Moreover, there is no value within the column of Cronbach's alpha if an item is deleted that is higher than the corresponding Cronbach's alpha (Table 23). Therefore, the measures of model 1 constructs demonstrate high reliability.

5.5.4 CONFIRMATORY FACTOR ANALYSIS RESULTS FOR MODEL 1

Based on the results of EFA in Section 5.5.2.1, based on Kaiser's eigenvalue-greater-than-one rule, two factors were extracted among the observed variables which were set to measure the four constructs (fear of losing family control and influence, fear of losing family identity, fear of losing binding social ties and fear of losing renewal of family bonds). The fear of losing family identity construct and fear of losing renewal of family bonds construct is cross-loaded under factor 1; at the same time, fear of losing family control and influence construct and fear of losing binding social ties are crosses loaded under factor 2. The reason can be attributed to the fear of losing SEW dimensions belong to the fear of losing SEW so that the relationship between these dimensions could be close to each other. In this case, EFA failed to specificity the right number of factors to match the number of constructs in model 1. However, the two further factors could be extracted if the scree test criterion was followed. According to Figure 6, the 'elbow break' is between 4 and 5, demonstrating 4 significant factors could be retained.

Therefore, to dealing with the inconsistency results between Kaiser's eigenvalue-greater-than-one rule and scree test criterion, confirmatory factor analysis (CFA) will bring into the data analysis. First, different from EFA, CFA can specify the exact correspondence between indicators and factors by following the hypothesis (Kline, 2016). Especially, CFA should be identified before entering the further analysing that is different from EFA which would be not identified (Kline, 2016). Thus, CFA has no rotation phase. Second, CFA is more towards the model that would estimate whether the particular variance is shared between certain pairs of indicators (Kline, 2016).

In this section, in the beginning, it will test the model identification, convergent validly, discriminant validity and common method bias in order to create a favourable context for running the CFA of model 1. The results for the model fit will be presented at the end of this section.

5.5.4.1 MODEL IDENTIFICATION

The degree of freedom (df) is calculated by using the number of observations minus the number of parameters which would be estimated within an SEM model. In order to generate solutions, precise estimation and powerful tests within a dataset, the negative df should be avoided (Blunch, 2013). As mentioned by Blunch (2013), under-identified, over-identified and just-identified models are based on the value of the degree of freedom. When df equals 0, it shows the number of distinct sample moments equal to the number of distinct parameters to be estimated. In this situation when df is 0, the model is just-identified which will reproduce a unique solution from SEM software. For example, there are two equations (Kline, 2016):

$$\alpha + \beta = 6$$

$$2\alpha + \beta = 10$$

In the two formulates, 6 and 10 denote the two observations, while α and β represents the two unknown parameters. SEM software will then compute a unique solution which is α = 4, and β = 2 that will perfectly reproduce observation 6 and 10.

When the number of distinct sample moments is larger than the number of distinct parameters to be estimated that results in the df to be positive, the model will be over-identified. For example, there are three formulates listed below (Kline, 2016).

$$\alpha + \beta = 6$$

$$2\alpha + \beta = 10$$

$$3\alpha + \beta = 12$$

In the same vein, α and β are two free parameters, at the same time, 6, 10 and 12 are three observations. Among the three equations, there would be multi-solutions generated by SEM software. For instance, when α = 4 and β=2, the first two equations could be satisfied; when α = 2 and β=6, the last two equations would be satisfied. Thus, when a testing model is over-identified, SEM software can generate different solutions.

Finally, when the number of distinct sample moments is less than the number of distinct parameters to be estimated, df scores are negative which shows the testing model is under-identified. For example:

$$\alpha + \beta = 6$$

In the equation above, α and β can be any number. In this case, SEM software cannot specify α and β and then fail to produce a particular solution. When a testing model is under-

identified, the SEM software will fail in parameter estimation. The formula for calculating df for the current study is:

df = total number of observed variables within a model * (total number of observed variables +1)/2 – [(the number of variances) + the number of regression coefficients + the number of covariances]

In model 1, there are 28 observed variables within model 1, with 56 number of variances (28 variables + 28 error terms) and 7 regression coefficients between exogenous variables (fear of losing family control and influence, fear of losing family identity, fear of losing family binding social ties and fear of losing renewal of family bonds) and endogenous variable (firm innovativeness), and 11 covariances among the model constructs. Following on the formula mentioned above, the df of model 1 is 329, showing model 1 is an over-identified model.

5.5.4.2 CONVERGENT VALIDITY

This section will start with CFA for a single dimension to check the factor loadings. In addition, the average variance extracted statistics (AVE), and at the same time, the composite reliability (CR) will be calculated based on these loadings and further presented in this section.

TABLE 25: MODEL FIT OF EACH CONSTRUCT AND WEIGHT ESTIMATES (FACTOR LOADINGS)

N=412				
Constructs	Items	unstandardized Weight Estimates	Standardized Weight Estimates	Model fit
Fear of losing family control	FC1	1	.939	Just-identified model
	FC2	.987	.934	
	FC3	.930	.930	
Fear of losing family identity	FI1	.963	.893	CMIN=22.689 (CMIN/DF = 7.56), p < .001, NFI = .987, CFI= .988, RMSEA = .159
	FI2	.989	.924	
	FI3	1	.933	
	FI4	.978	.910	
Fear of losing family binding social ties	FBST1	.938	.859	Just-identified model
	FBST2	1	.934	
	FBST3	.920	.891	
Fear of losing renewal of family bonds	FRFB1	.910	.849	CMIN=1.779 (CMIN/df = .89), p = .411, NFI = .999, CFI= 1, RMSEA = .000
	FRFB2	.925	.861	
	FRFB3	1	.955	
	FRFB4	.883	.831	
Innovativeness	Innov1	.961	.844	Just-identified model
	Innov2	1	.942	
	Innov3	.897	.903	
Environmental dynamism	EnD1	.798	.810	Just-identified model
	EnD2	1	.980	
	EnD3	.932	.903	
Environmental fitness	EnF1	.956	.854	CMIN=.25.13 (CMIN/DF = .5.026), p <.001, NFI = .978, CFI= .99, RMSEA = .099
	EnF2	.978	.899	
	EnF3	.982	.884	
	EnF4	.964	.849	
	EnF5	1	.900	
Domestic environmental munificence	DoM1	.932	.839	Just-identified model
	DoM2	1	.909	
	DoM3	.843	.815	

Note. Constructs should be just-identified or over-identified

Raykov (2004) and Hancock and Mueller (2001) suggested the reliability of factor measurement in the CFA model can be estimated by a standardized coefficient and unstandardized coefficient of indicators from the same factor. There are two forms of the reliability of factor measurement. One is the average variance extracted (AVE) regarding the average of the squared standardized pattern coefficients derived from indicators that are dependent on the same factor (Kline, 2016). The other type is composite reliability (CR) which is the ratio of explained variance over total variance within a single dimension CFA (Raykov, 2004).

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + (\sum \epsilon_i)}$$

The CR equation is listed above, where ∑ λ is the sum of the unstandardized coefficients of the indicators from the same factor and ∑ε denotes the sum of unstandardized error variance (Kline, 2016). Different from the CR, ∑λ represents the sum of standardized coefficients of the indicators for the same factor. VAR (ε) is the sum of the variance (Kline, 2016).

Based on the equation, dimensional CFA for each factor and corresponded indicators was conducted, and the results are presented in Table 25. To better view the weights, the strongest weight of each factor has been a constraint to 1 (Blunch, 2013). All 8 factors show the excellent factor loadings with the minimum loadings above .7 for both unstandardized and standardized weights.

TABLE 26: CONVERGENT VALIDITY

N=412		
Convergent Validly	AVE	CR
Fear of losing family control and influence	.873	.954
Fear of losing family identity	.837	.954
Fear of losing family binding social ties	.801	.924
Fear of losing renewal of family bonds	.776	.929
Innovativeness	.805	.925
Environmental dynamism	.811	.927
Environmental fitness	.786	.948
Domestic environmental munificence	.731	.891

Note. AVE (average variance extracted) and CR (composite reliability), Recommended AVE is .5 and CR is .7

According to Blunch (2013), the thresholds for AVE and CR are .5 and .7 respectively, demonstrating the reliability of the measures and accepted level of convergent validity. All the AVE and CR scores were calculated by using the formulas shown in Table 26. It shows the AVE ratio for all the model 1 constructs ranges between .731 and .873, and CR ranges between .891 and .954, which are higher than the thresholds. These results point to a high degree of convergent validity.

5.5.4.3 DISCRIMINANT VALIDITY

Discriminant validity will be tested by comparing the squared correlations with AVE scores for each relationship between the variables (Blunch, 2013).

TABLE 27: DISCRIMINANT VALIDITY (AVE AND SQUARED CORRELATION AMONG THE CONSTRUCTS)

Variables	AVE	FC	FI	FBST	FRFB	INNOV	EnD	EnF
FC	.873							
FI	.837	.466						
FBST	.801	.689	.426					
FRFB	.776	.384	.623	.407				
INNOV	.805	.005	.020	.001	.065			
EnD	.811	.0004	.069	.0004	.052	.364		
EnF	.786	.010	.011	.0001	.0009	.055	.007	
DoM	.731	.001	.003	.001	.004	.000001	.001	.031

Note. Recommend discriminant validity is AVE > squared correlations between variables)

Innov = firm innovativeness
FC = Fear of losing family control and influence
FI = Fear of losing family identity
FBST= Fear of losing family binding social ties
FRFB = Fear of losing family renewal family bonds
EnD = Environmental dynamism
ENF = Environmental fitness
DoM = Domestic environmental munificence

According to the rule of thumb for identifying the violation of discriminant validity, the AVE score should be higher than the squared correlation (Blunch, 2013). In Table 27, AVE scores of the model 1 constructs are presented, as well as the factor correlation between two variables was squared located in the correlation squared column. Based on the observation, all the AVE scores are larger than their corresponding values within the correlation squared column. It demonstrates that there is no violation of the assumption of discriminant validity.

5.5.4.4 COMMON METHOD VARIANCE (CMV)

The current study has conducted the CFA marker technique to verify if CMV is likely to have existed (Lindell & Whitney, 2001; Williams et al., 2003). The mechanism behind this technique is to select a marker variable which is theoretically unrelated to other focus variables within a model and then examine if the marker variable has a statistically significant relationship with other focus variables (Lindell & Whitney, 2001). As the marker variance is theoretically unrelated to the other substantive variables, the expected correlation between the marker variable and the substantive variables is 0 (Lindell & Whitney, 2001; Richardson et al., 2009). When a model involved a marker value, the shared variance between the marker and the substantive variables can be identified as CMV (Williams et al., 2003; Richardson et al., 2009). This technique can examine CMV regarding the implicit theory (respondents suspected or have noticed the reasoning behind the questions in a questionnaire and then generated a degree of intention to connect the responses to the questions), and the consistency motif (respondents would maintain the consistency of the responses for the questions which have similar wording structures) (Podsakoff et al., 2003; Simmering et al., 2015).

In the current study, the selected marker variable is radical innovation education (RIE) which was built to ensure respondents held basic knowledge of innovation (e.g. identifying the difference between radical and incremental innovation) before responding the questions relating to innovation. Theoretically, it does not demonstrate a relationship with both the fear of losing SEW dimensions and SEW and connection with innovativeness.

In addition, the marker variable should be a latent variable which is similar to other substantive variables regarding the structures (i.e. constructed by Likert scales) (Simmering et al., 2010). The RIE is a latent variable that is similar to other substantive variables that are constructed by utilising 7-point Likert-scales. Above the descriptions, the marker variable has matched the criteria of testing the correlation with substantive variables; also, the marker variable is theoretical unrelated, but similar to the substantive variables (e.g. structures) (Simmering et al., 2010). According to Table 28, the correlations between the marker

variable and the substantive variables of model 1 were insignificant (-.011<b<.054, p>.208), demonstrating model 1 constructs have no CMV regarding consistency motif and implicit theory.

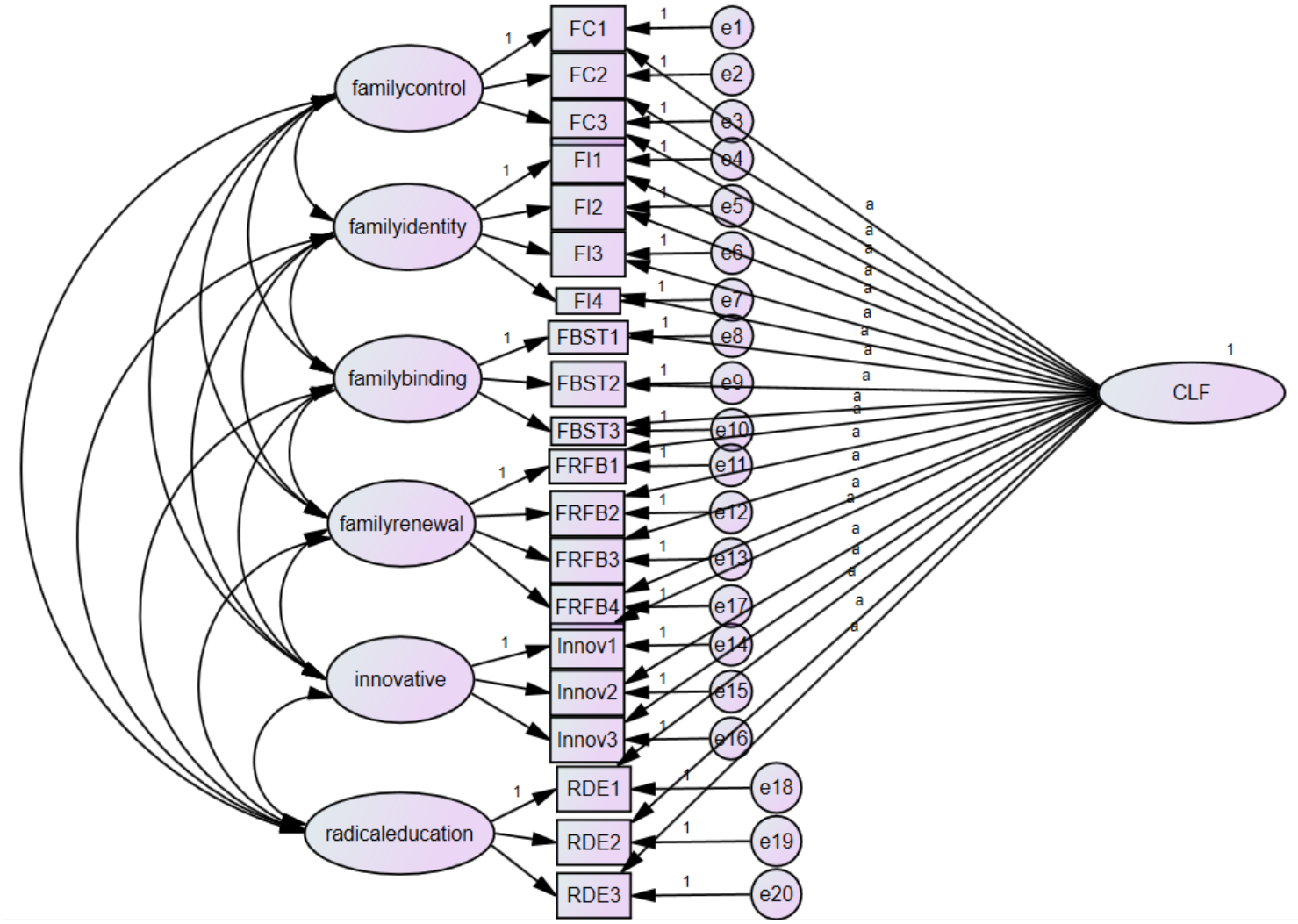
TABLE 28: CORRELATIONS BETWEEN RADICAL INNOVATION EDUCATION AND MODEL 1 CONSTRUCTS

Correlations: Radical innovation education and constructs of model 1		
Variables	Sig. (2-tailed)	Pearson Correlation
Fear of losing family control and influence	.820	-.011
Fear of losing family identity	.271	.054
Fear of losing binding social ties	.208	-.062
Fear of losing renewal of family bonds	.593	.026
Innovativeness	.262	.055

Note. Significant level: ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

In the CFA model shown in Figure 14, a common latent factor (CLF) was created and then connected to the overall observed variables (observed variables from substantive variables and observed variables from the marker variable – RIE) in the model by using direct paths, for the purpose of observing the shared (common) variance among the variables. In addition, all the paths between the CLF and observed variables were constrained in the current CFA model. The results show the shared weights are .34 that indicate the shared variance is 11.56% (.34 * .34 = .1156), demonstrating that the RIE shared 11.56% variance with the substantive variables. As the results do not exceed the threshold level of 50% of the total variance (Podsakoff et al., 2003), the CMV states at an acceptable level.

FIGURE 14: CFA MARKER TECHNIQUE TO VERIFY CMV



Although the current study has implemented marker variable analytic technique to prevent CMV, it still needs to conduct Harman's one-factor test to verify if the CMV is likely existed (Podsakoff et al., 2003). After the one-factor test, it shows the variance of the first component is 33.501% which is a seemingly large variance out of the total variance (Table 29). However, the results do not exceed the threshold level of 50% of the total variance (Podsakoff et al., 2003). Therefore, under Harman's one-factor test, the CMV states at an acceptable level.

TABLE 29: HARMAN'S ONE-FACTOR TEST

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.380	33.501	33.501	9.380	33.501	33.501
2	5.306	18.949	52.450			
3	4.307	15.382	67.832			
4	1.673	5.976	73.808			
5	1.268	4.528	78.335			

Note. Recommended cumulative variance should be less than 50%

5.5.4.5 RESULTS OF MODEL FIT

The CFA is conducted by using AMOS 22 software and is performed through the Maximum Likelihood (ML) estimation (Blunch, 2013). Assessing the model fit is essential. According to Kline (2016), a model is specified by a theory which motivated researchers to construct theory related measures and then utilise these measures to collect data in a defined population. Based on the above logic, if the model is consistent with the mechanism in the real world, the model should fit the data (Hu & Bentler, 1999; Blunch, 2013). If the model does not fit the data or fit the data poorly, the outcomes will then challenge the theory. Namely, the hypotheses which were created in the model specification will be considered to be rejected (Kline, 2016).

Different from multiple regression analysis which only allows one-way prediction (using one to predict another), SEM can detect possible relationships among variables and provide a different solution to encourage a researcher to re-specify the model to fit better to the data (Kline, 2016).

In order to create the model with the best fit, the CFA will start to view the fit of independent variables, then the fit of dependent and independent variables and, lastly, the fit of the independent, dependent and control variables overall (Kline, 2016). The CFA Maximum Likelihood estimation of model 1 will be presented in two different models: (1) model A will include measures relating to independent variables (fear of losing family control and influence, fear of losing family identity, fear of losing family binding social ties, and fear of losing renewal of family bonds); (2) model B will include measures regarding dependent variable (firm innovativeness) and independent variables.

5.5.4.5.1 RESULT OF MODEL FIT: INDEPENDENT VARIABLES

Based on the model specification, model A contains four fear of losing SEW dimensions (shown in Figure 15 and Figure 16).

Before demonstrating the model fit results of model A, it is necessary to introduce and discuss the assessment criteria of the fit indices which would be displayed in the model fit section in AMOS 22. Within the AMOS 22 model fit section, CMIN statistic is the chi-statistic (x^2) (Blunch, 2013). Normally, the exact fitting model will be rejected when the p-values have met the significant level (p<.001). However, CMIN is sensitive to sample size in terms of the rejecting of the exact fitting model could happen, to a large extent, within either a large (e.g. greater than 300) or a small sample (e.g. less than 50) (Bentler & Bonett, 1980). When the sample is either large or small and CMIN is significant (p<.05), the model fit can be referred to the CMIN/DF ratio (Wheaton et al., 1977). The recommendations of CMIN/DF scores range between 2 (Tabachnick & Fidell, 2007) and 5 (Weaton et al., 1977). When the CMIN/DF value is located between 3 and 5, it depicts acceptable model fit; and when the CMIN/DF value is located between 2 and 3, it depicts good model fit (Tabachnick & Fidell, 2007). The more the CMIN/DF scores are close to 2, the better the model fit will be (Hu & Bentler, 1999).

In addition, according to Kline (2011), when the CMIN (x^2) statistic is significant, the quality of the model fit would also be dependent on other model fit indices (e.g. approximate fit indices, and incremental indices) to identify the model fit issue. For instance, the goodness-of-fit statistic (GFI) can act as the alternative indices of CMIN (x^2) regarding calculating the proportion of variance which is explained by the estimated population covariance (Tabachnick & Fidell, 2007). The expected GFI value (range from 0 to 1) should exceed .9 (cut-off) to show good model fit (Miles & Shevlin, 1998; Hu & Bentler, 1999).

However, GFI is highly reliant on the degree of freedom, which can result in bias while identifying model fit. Sharma et al. (2005) argued it would generate downward GFI bias when the degree of freedom is small; or upward GFI bias when the sample size is large (Bollen, 1990). The same circumstance lies in adjusted GFI (AGFI) in that AGFI is highly dependent on the degree of freedom in which the increasing of AGFI can be impacted by increasing of sample size (Tabachnick & Fidell, 2007). Because of the unsalable model fit indices, GFI and AGFI will not be treated as a reference point for the model fit in the current study.

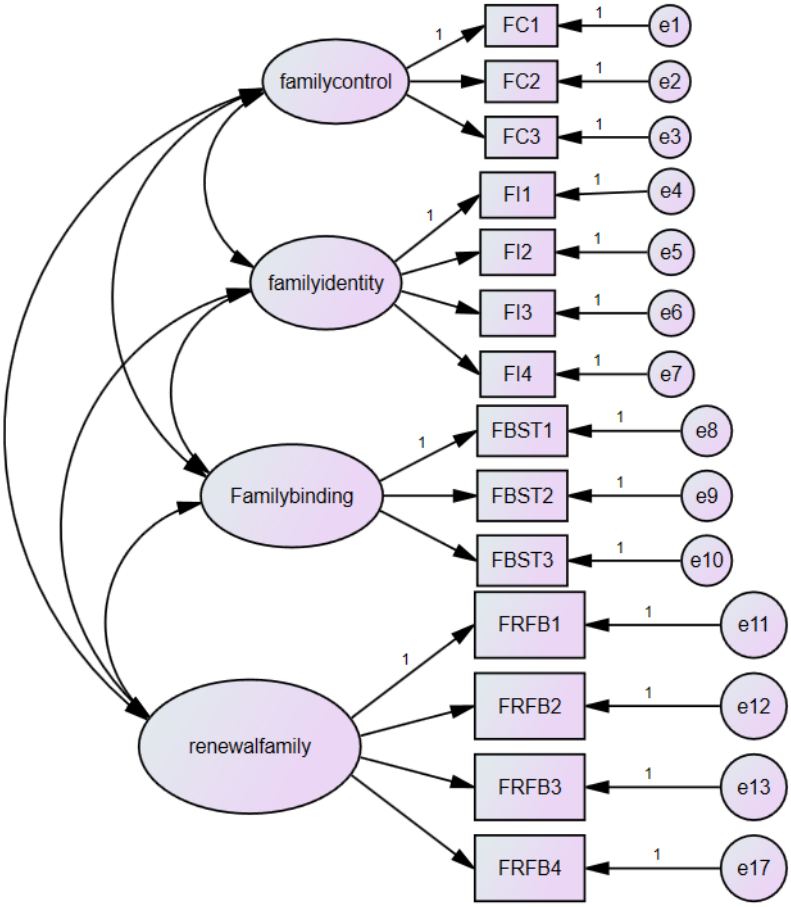
Normal Fit Index (NFI) is to compare the difference between x^2 and null x^2 which indicates the incorrection of the constructs. According to Bentler and Bonett (1980), when NFI statistic is (1) between .9 and .95, it demonstrates an acceptable level of model fit; (2) higher than .95, it shows a good model fit.

For other model fit indices, according to Hu and Bentler (1999) and Blunch (2013), when CFI is higher than .95, standardized RMR (SRMR) radio is less than .08 and RMSEA ratio is less

than .08, the model will have a good quality of fit showing the measures are accurate within the underlying constructs. Standardized RMR (SRMR) is the absolute measure of fit indices defining the level of difference between the observed correlation and prediction correlation (Hu & Bentler, 1999). Normally, a model will be identified as a moderate fitting model when the standardized RMR (SRMR) index ranges between .05 and .08; as a good fitting model when the standardized RMR (SRMR) index ranges between .03 and .05; and as a high quality fitting model when standardized RMR is less than .03 (Hu & Bentler, 1999).

In addition, RMSEA is to determine the quality of the model fit. Based on the rule of thumb, .1 is suggested as the cut-off for RMSEA; when RMSEA ranges between .08 and .1, it indicates moderate model fit, between .06 and .08, shows a good model fit (Hu & Bentler, 1999; Blunch, 2013). However, it is also vital to view the significant level of RMSEA. When RMSEA is significant (PLOSE <.001), the close-fitting model will be rejected which will guide researchers to view the confidence interval to determine to retain or reject the poor-fitting model (Hu & Bentler, 1999). Based on the rule of thumb, the poor-fitting model will be retained when the upper bound of a 95% confidence interval (CI) is higher than .1, or the poor-fitting model would be rejected when the upper bound of a 95% confidence interval (CI) is less than .1 (Hu & Bentler, 1999).

FIGURE 15: INITIAL MODEL A



The model A was initially constructed by drawing covariance paths among the latent variables (fear of losing family influence and control, fear of losing family identity, fear of losing binding social ties and fear of losing renewal of family bonds) (Figure 15). The initial results of the CFA Maximum Likelihood estimation show that: CMIN (x^2) = 351.978 (CMIN/DF=4.957), p<.001, NFI=.947, CFI=.957, RMSEA=.098, PCLOSE<.001, 95% Confidence Interval (CI) (.088, .108), standardized RMR=. 0429.

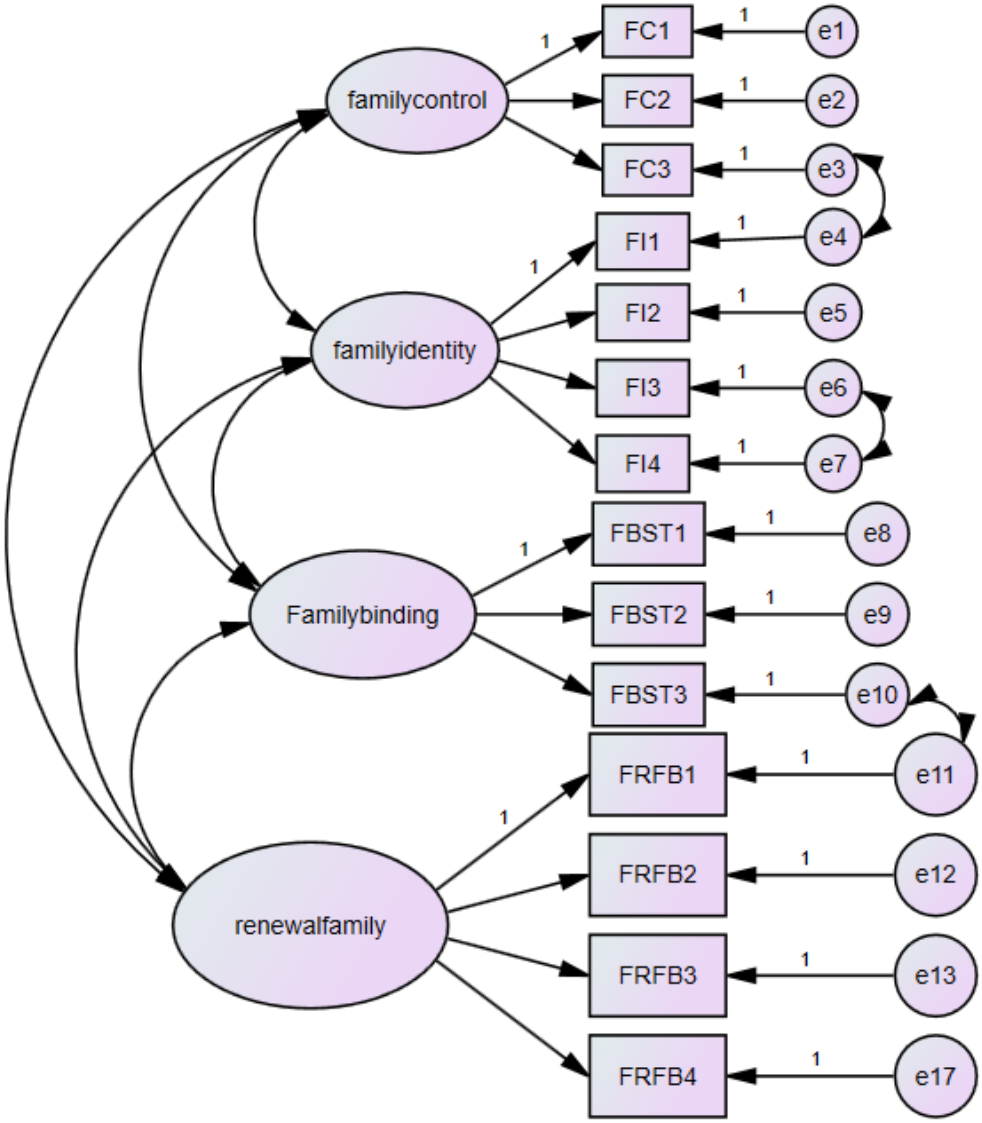
Based on the initial results, CMIN is significant, and CMIN/DF is close to 5 which is the cut-off line for acceptable model fit. NFI is slightly below .95 and RMSEA is close to .1. Above the model fit indexes, the model has a fair quality of model fit, which has demonstrated the chance to improve the model fit of the current model (Kline, 2016). According to Blunch (2013), it is necessary to view the modification indices section to check if there are high modification indexes (MI) values among the components within a model. Generally, MI value indicates the strength of the correlation between two components (e.g. latent variables, observed variables or error variances of a model) which have not been related by using direct or covariance paths while constructing a model (Tabachnick & Fidell, 2001). The larger the MI value, the stronger correlation exists between the two components. Adding

covariance paths between the components within a model is a way to improve model fit (Kline, 2016).

Following the rule of thumb, it is suggested to identify the MI value which is above the numerical value of 10 among the paired components in the modification indices section (Blunch, 2013). After the large MI values (>10) are identified, a covariance path could be added between the two particular components within a model (Kline, 2016). However, since the AMOS 22 modification indices section will provide every possible correlation among the paired components, such as the suspected correlation between a factor and an error variance (Blunch, 2013). Researchers should identify relationships between the two components by (1) following the theoretical implication, and (2) with logic reasons of why the two particular components are sharing the variation within a model (Tabachnick & Fidell, 2001). For instance, it has shown the modification indices are 17.374 between e6 and the factor of fear of losing family binding social ties (Figure 15). However, e6 is the disturbance term of an indicator under the factor of fear of losing family identity, which has no correlation with fear of losing family binding social ties based on the zero-correlation pattern mentioned by the theoretical implication (Kline, 2016). Although modification indexes depict the correlation between e6 and the factor of fear of losing family binding social ties (MI>10), the theory tells the zero correlation between the two components.

However, error terms among the indicators are allowed to correlate with each other as long as the CFA is identified (degree of freedom ≥ 0) but unstandardized (Kline, 2016). However, the estimation results between standardized CFA and unstandardized CFA have little difference when the sample size is large (i.e. above 300) (Kline, 2016). The AMOS 22 results section has shown there are large modification indexes between e6 and e7 (MI=19.213), between e3 and e4 (MI=14.389), and between e10 and e11 (MI= 11.217). The improvement of the model fit was conducted by adding the paths of the covariance between e3 and e4, between e6 and e7, and between e10 and e11.

FIGURE 16: MODEL A

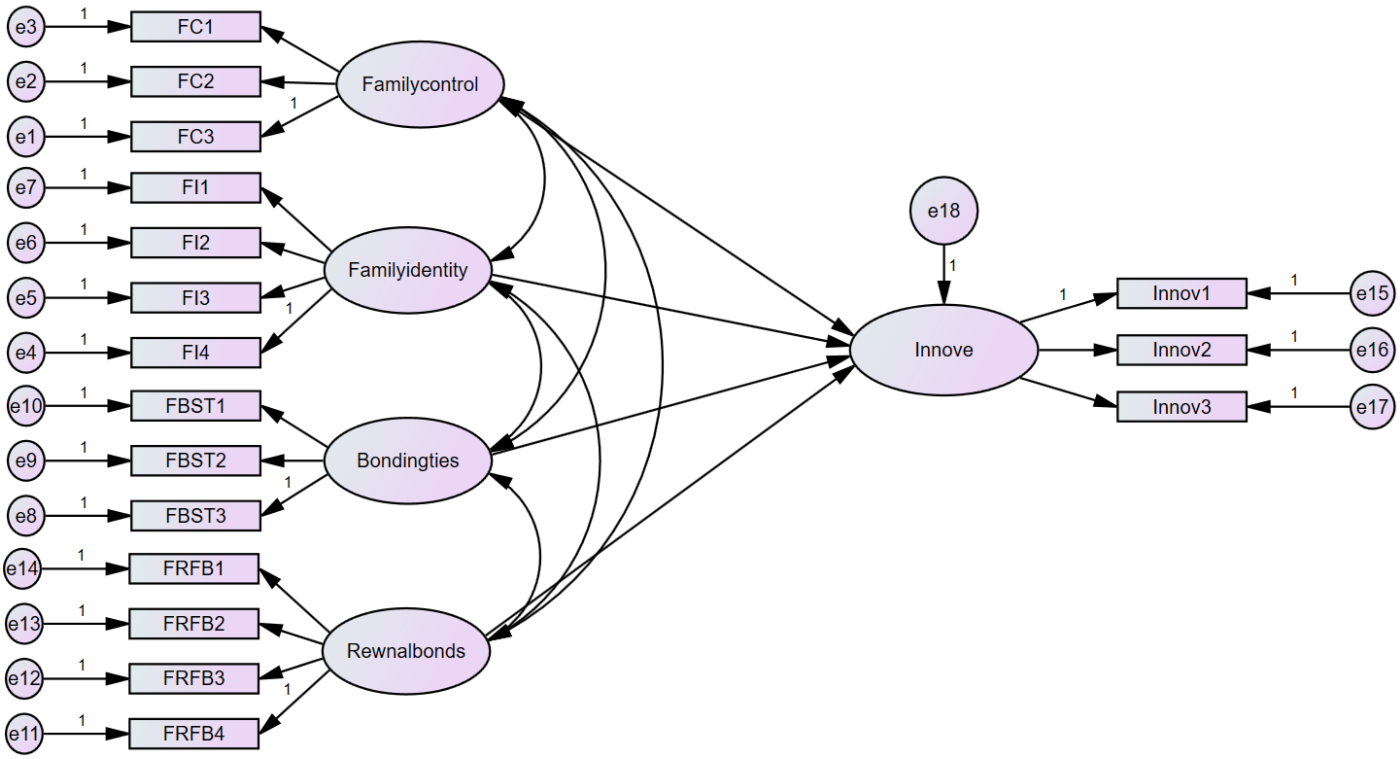


After the improvement (Figure 16), the results of the CFA Maximum Likelihood estimation demonstrate that: CMIN (x^2) =299.471 (CMIN/DF=4.404), p<.001, NFI=.955, CFI=.965, RMSEA=.091, PCLOSE<.001, 95%CI (.081, .102), standardized RMR=.0419.

According to the criteria of identifying the quality of model fit, (1) CMIN is significant (p<.001), showing the exact fitting model (H0) will be rejected; (2) RMSEA is significant (PCLOSE<.001) which demonstrates the close-fitting model (H0) can be rejected; (3) 95% confident intervals (CI) of RMSEA is ranging between .081 and .102 (the upper bound has exceeded .1) showing the poor fitting model will be retained; (4) the results of NFI and CFI are greater than .95 that have shown good quality of model fit; (5) Standardized RMR (SRMR) is .0419 which is lower than .5 demonstrating the good model fit; (6) the chi-square per degree of freedom (CMIN/DF) is 4.404 which is close to 5, showing the acceptable quality of model fit. In conclusion, model A has a moderate quality of the model fit.

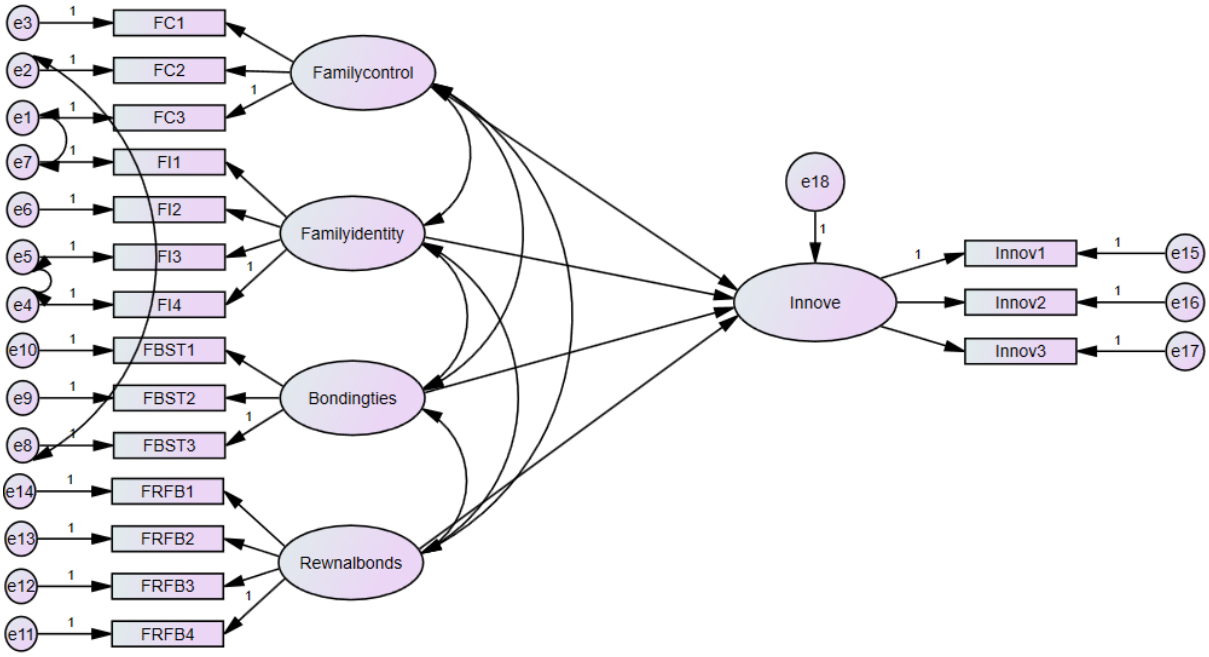
5.5.4.5.2 RESULTS OF MODEL FIT: INDEPENDENT AND DEPENDENT VARIABLES

FIGURE 17: INITIAL MODEL B



The initial model B was constructed as shown in Figure 17. For the initial model, the CFA Maximum likelihood estimation shows that: CMIN=429.382 (CMIN/DF=3.939), p<.001, NFI=.945, CFI=958, RMSEA= .085, PCLOSE<. 001, 95% CI (.076, .093), Standardized RMR = .0445. Based on the assessment criteria of the model fit indices above, CMIN is significant, and CMIN/DF is between 3 and 5, which show an acceptable model fit. At the same time, NFI is less than .95 indicating a moderate model fit, and CFI is above .95 demonstrating a good model fit. RMSEA stays between .08 and .01 range and is significant (PCLOSE<.001). Based on the model fit indices above, the model fit of the initial model B is at an acceptable level.

FIGURE 18: MODEL B

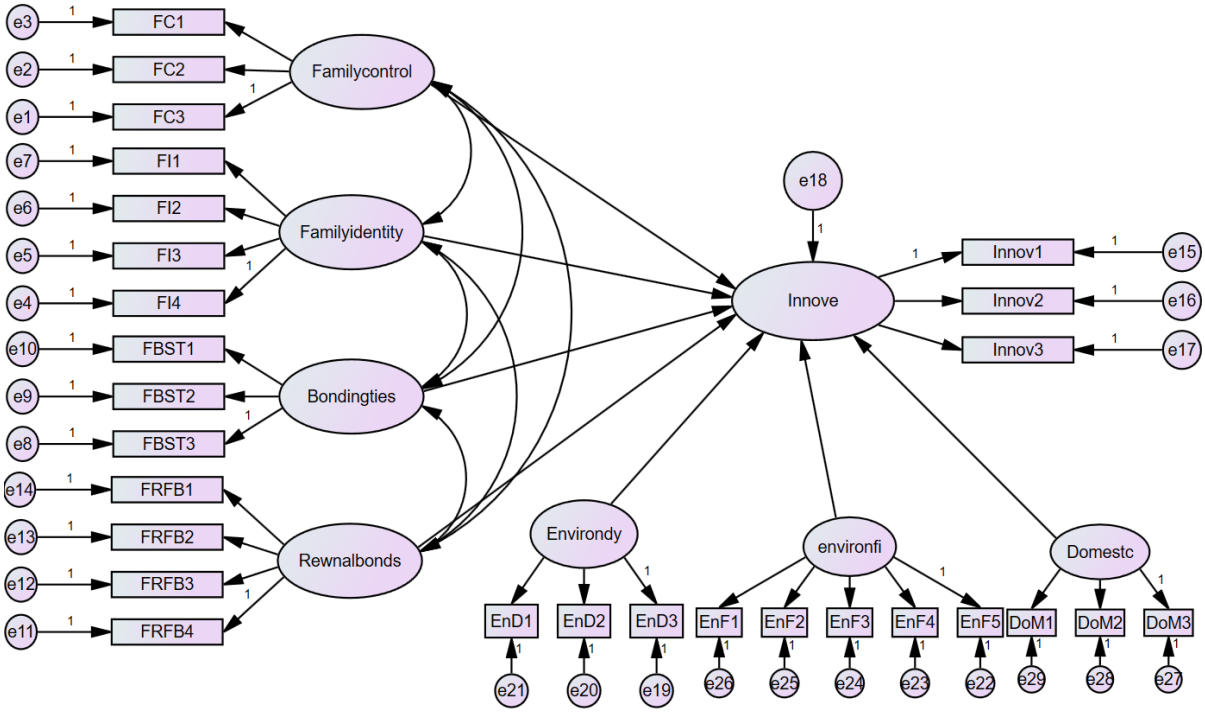


Based on the modification indices section within the initial model, three large MI values were found, respectively, between e4 and e5 (MI=18.862), between e1 and e7 (MI=13.848), and between e2 and e8 (MI=32.749). Model B has been improved by adding the covariance paths between e4 and 45, between e1 and e7, and between e2 and e8 (Figure 18), and the results of the CFA Maximum Likelihood estimation demonstrate that: CMIN=377.836 (CMIN/DF=3.564), p<.001, NFI=.951, CFI=.964, RMSEA=.079, PCLOSE<.001, 95%CI (.07, .088), standardized RMR=.0434. Based on the criteria of identifying the quality of model fit, (1) CMIN and RMSEA have met significant level (p<.001), showing the exact fitting model (H0) and the close-fitting model (H0) will be rejected; (2) 95% confident intervals of RMSEA is ranging between .07 and .088, which has not exceeded .1 showing the poor fitting model will be rejected; (3) the results of NFI and CFI are greater than .95 that have shown good quality of model fit; (4) RMSEA is between .06 and .08 showing a moderate model fit; and standardized RMR (SRMR) is less than .05 demonstrating the good model fit; (5) the chi-square per degree of freedom is 3.564 which is between 3 and 5, showing the acceptable quality of model fit. In conclusion, model B has a moderate quality of the model fit.

5.5.5 SEM RESULTS

The structural equation model of model 1 was initially formulated by following the theory mentioned in Chapter 3 Section 2 (see Figure 19).

FIGURE 19: SEM OF MODEL 1 (INITIAL MODEL)



The CFA Maximum Likelihood estimation demonstrates that: CMIN=1067.806 (CMIN/DF = 3.169), p < .001, NFI = .913, CFI= .939, RMSEA = .073, PCLOSE<.001, 95% CI (.068, .078). Based on the model fit assessment criteria mentioned in Section 5.5.4.5.1, CMIN/DF is between 3 and 5 which is at the acceptable level, NFI and CFI are both less than .95 showing the moderate model fit, and RMSEA is between .6 and .8 demonstrating a moderate model fit. Therefore, the model fit of the current model is at the moderate level.

Such a moderate level of model fit can be attributed to covariance paths among the independent factors, or among error variances are missing within the initial model (Kline, 2016). For instance, there are covariance possibilities among independent variable constructs because these variables are under the umbrella of fear of losing SEW. Also, the covariance might exist among the control variables (e.g. environmental fitness, environmental dynamism and domestic environmental munificence) which were non-specified while constructing the model. Thus, the current model could be improved by following the modification indices section (Blunch, 2013).

5.5.5.1 MODEL FIT IMPROVEMENT AND HYPOTHESIS RESULTS PRESENTATION

The improvement of the initial model will be conducted in two steps, (1) conducting CFA for each construct to examine the fit and detecting if there are items with weak factor loadings (Hooper et al., 2008); (2) following modification indexes guided in AMOS 22 modification indices section (Blunch, 2013).

TABLE 30: MODEL FIT OF EACH CONSTRUCT AND WEIGHT ESTIMATES

Constructs	Items	Estimates (initial)	Estimates (Improved)	Model fit (initial)	Model fit (improved)
Fear of losing family control	FC1	1		Just-identified model	
	FC2	.987			
	FC3	.93			
Fear of losing family identity	FI1	.978	.974	CMIN=22.689 (CMIN/DF = 7.56), p < .001, NFI = .987, CFI= .988, RMSEA = .159	**CMIN=.138 (CMIN//DF = .138), p = .71, NFI = 1, CFI= 1, RMSEA = .000**
	FI2	1	1		
	FI3	.989	.954		
	FI4	.963	.925		
Fear of losing family binding social ties	FBST 1	.938		Just-identified model	
	FBST 2	1			
	FBST 3	.92			
Fear of losing renewal of family bonds	FRFB 1	.91		CMIN=1.779 (CMIN/df = .89), p = .411, NFI = .999, CFI= 1, RMSEA = .000	
	FRFB 2	.925			
	FRFB 3	1			
	FRFB 4	.883			
Innovativeness	Innov 1	.961		Just-identified model	
	Innov 2	1			
	Innov 3	.897			
Environmental dynamism	EnD1	.798		Just-identified model	
	EnD2	1			
	EnD3	.932			
Environmental fitness	EnF1	.956	.929	CMIN=.25.13 (CMIN/DF = .5.026), p <.001, NFI = .978, CFI= .99, RMSEA = .099	**CMIN=5.318 (CMIN/DF = 1.329), p = .256, NFI = .997, CFI= .999, RMSEA = .028**
	EnF2	.978	.957		
	EnF3	.982	.983		
	EnF4	.964	.968		
	EnF5	1	1		
Domestic environmental munificence	DoM1	.932		Just-identified model	
	DoM2	1			
	DoM3	.843			

During the CFA, the item which has the largest factor loading has been unitised by 1 in order to generate a convenient way to view the loadings (Schumacker & Lomax, 2016). In Table 30, all the factor loadings from the items are strong and higher than the threshold of .6.

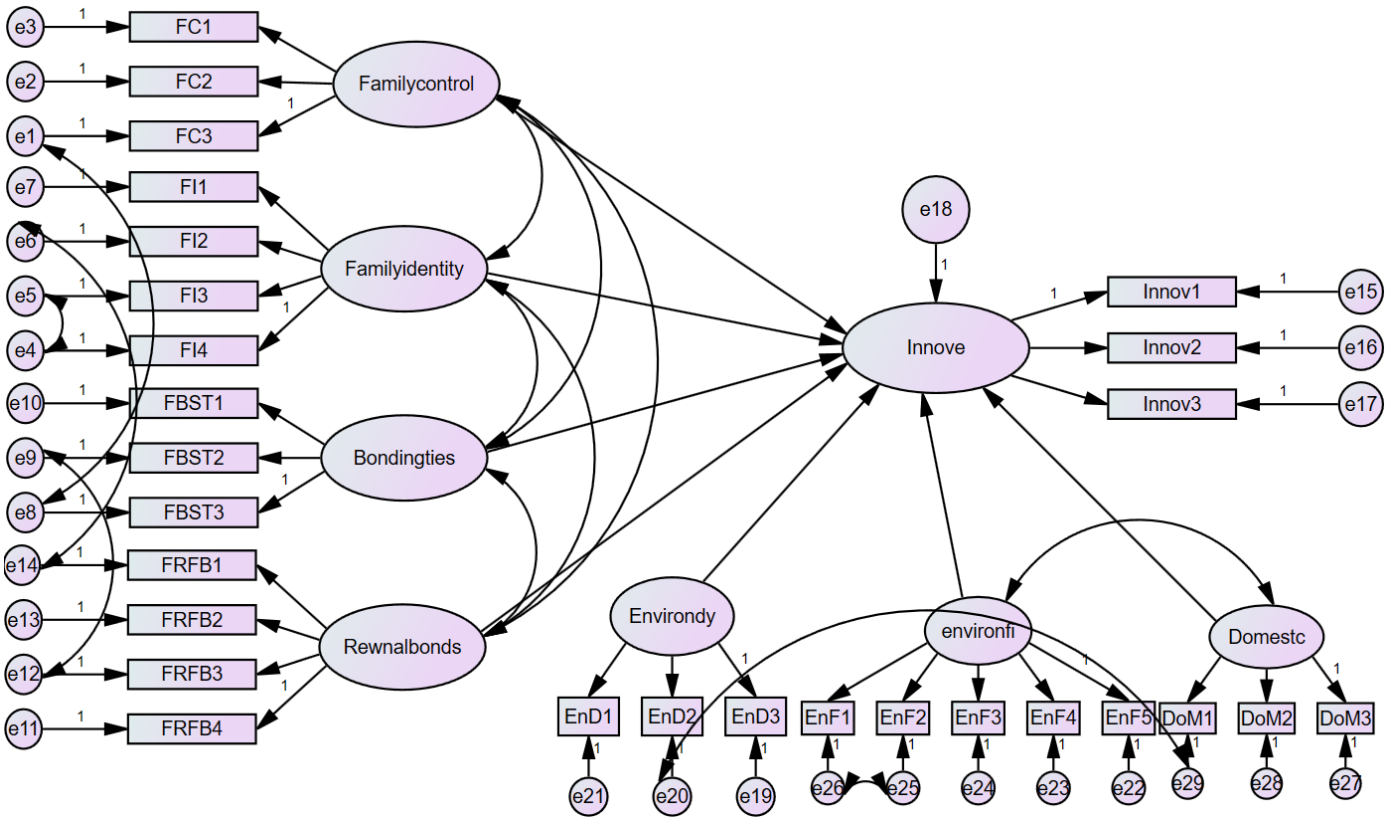
The constructs of fear of losing family control, fear of losing family binding social ties, innovativeness, environmental dynamism and domestic environmental munificence are just-identified models in terms of the number of distinct sample moments equals the number of

distinct parameters to be estimated. Namely, these constructs have a perfect model fit. At the same time, although the CMIN of fear of losing family identity is statistically significant, the other model fit indices have demonstrated the good model fit (NFI = .999, CFI= 1, RMSEA = .000).

However, the fear of losing family identity and environmental fitness had poor-fitting models during the initial CFA (see the model fit (initial) column in Table 30). The improvement of the model fit followed the guidance within modification indices within CFA outputs. The indices suggested the correlation possibilities between the error terms of EnF1 and EnF2, and between the error terms of FI1 and FI2. After adding paths between the error terms, the model of fear of losing family identity (CMIN=.138 (CMIN/DF = .138), p = .71, NFI = 1, CFI= 1, RMSEA = .000) and model of environmental fitness (CMIN=5.318 (CMIN/DF = 1.329), p = .256, NFI = .997, CFI= .999, RMSEA = .028) have resulted in better fit.

After the single CFA for each construct has been adopted, the modification indices of the overall testing model demonstrated the possible covariance between two components (constructs, errors and observed variables) within a model (Blunch, 2013).

FIGURE 20: SEM OF MODEL 1 (COMPLETED MODEL)



A number of large MI were shown in the modification indices section – between environmental fitness and domestic environmental munificence (MI= 101.507), between e1 and e8 (MI=32.516), between e4 and e5 (MI= 19.754), between e20 and e29 (MI=18.844), between e25 and e26 (MI=17.251), between e6 and e14 (MI=14.326), and between e9 and e12 (MI=10.191). The final model has also been improved by following the suggestions within the modification indices (Figure 20), and the results of the CFA Maximum Likelihood estimation demonstrate that: CMIN=819.455 (CMIN/DF=2.483), p<.001, NFI=.933, CFI=.959, RMSEA=.060, PCLOSE=.001, 95%CI (.055, .065), standardized RMR=.0738. (1) CMIN and RMSEA have met significant level (p<.05), showing the exact fitting model (H0) and the close-fitting model (H0) will be rejected; (2) 95% confident intervals of RMSEA is ranging between .055 and .065, which has not exceeded .1 showing the poor fitting model will also be rejected; (3) the results of CFI are greater than .95 which have shown good quality of model fit, NFI is less than .95 demonstrating acceptable fit; (4) RMSEA is .6 which is good fit, and standardized RMR (SRMR) is .0739 which is between .6 and .8 demonstrating acceptable model fit; (5) the chi-square per degree of freedom is 2.483 which is less than 3 and is close to 2, showing good quality of model fit. Therefore, the current model has a good model fit.

5.5.5.2 CONTROL VARIABLES EVALUATION

In order to increase the degree of accuracy regarding the relationship between fear of losing SEW dimensions and firm innovativeness, the current study has involved more than three control variables, besides environmental dynamism, environmental fitness and domestic environmental munificence. The current study initially involved other control variables: gender and level of education. Gender and level of educational background have been transformed into different dummy categories. For instance, values of gender have been recoded into 0 for male and 1 for female, while the values of the level of education were separated into five dummy categories (0 and 1) from ‘have not completed high school’ to ‘PhD level’. Finally, the variables of size, managers’ age, managers’ industrial experience, managers’ firm experience, and firm age are objective measures that were directly brought to the SEM.

Different from regression analysis, involving more factors which are theoretically nonimportant to the endogenous factor will generate weak loadings and thereafter decrease the model fit in SEM (Ximenez, 2009). The results will generate less statistical power when the constructed model poorly fits the data (Blunch, 2013). In addition, a larger effect size would be required as a model keeps involving new exogenous factors (Kline, 2016). Thus, it

is vital to trim the model and keep the exogenous factors which are important to the endogenous factor.

TABLE 31: REGRESSION WEIGHTS BETWEEN THE CONTROL VARIABLES AND INNOVATIVENESS

Constructs	Estimates	Significant Level (P)	Statistically (un)Important to Innovativeness
Environmental dynamism	.557***	.000	Important
Environmental fitness	.341***	.000	Important
Domestic environmental munificence	-.154**	.002	Important
Firm age	.015	.122	no
Size (overall full-time employees)	.001	.359	no
managers' age	.006	.409	no
Manager's gender (1 = female, 0 = male)	.043	.761	no
Have not completed high school	-.381	.194	no
High school	-.309*	.034	Important
Bachelor	.458	.108	no
PhD advance	-1.308	.07	no
Manager's industrial experience	.001	.92	no
Manager's firm experience	.007	.661	no

Note. Significant level: ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

In Table 31, there are 4 control variables (environmental dynamism, environment fitness, domestic environmental munificence, respondents who held high school degrees). Different from regression analysis, the researcher has made the initial decision to keep the important control variables and then trim the non-important control variables by viewing the corresponding significant level (p> .05) to make an effective model (Kline, 2016). In addition, although involving more control variables can increase the degree of accuracy towards the effects between independent and dependent variables of a study, the larger sample size is also required to generate statistical power parallel with the increase of control variables (Becker, 2005).

The high school educational background was decided to retain in the current model. Indeed, the high school educational background dummy variable has shown a significant impact on firm innovativeness (p<.05); the dummy variables within the level of educational background have generated bias. There are only three managers holding master's degrees and one person holding a PhD degree, and most of the managers hold college and high school certificates. Therefore, model 1 will keep the variables which are the same as those within

SEM. The SEM results of the model 1 hypotheses are listed below, and standardized estimates will be reported.

5.5.5.3 MODEL 1 HYPOTHESIS TESTING RESULTS

TABLE 32: FINAL SEM RESULTS OF MODEL 1

Variables	R square			
Fear of losing family control and influence	0.02			
Fear of losing renewal family bonds	0.082			
Firm Innovativeness	.531			
Relationship variables	Standardized estimates	S. E	C.R	P -Value
Fear of losing family control and influence → Innovativeness	-.17*	.079	-2.025	.043
Fear of losing family identity→ Innovativeness	-.121	.082	-1.5	.134
Fear of losing family binding social ties→ Innovativeness	.014	.087	.175	.861
Fear of losing renewal family bonds→ Innovativeness	.288***	.084	3.797	.000
Main control variables				
Environmental dynamism → Innovativeness	.57***	.046	11.99	.000
Environmental fitness → Innovativeness	.317***	.061	6.20	.000
Domestic environmental munificence → Innovativeness	-.127*	.063	-2.493	.013

Note. Significant level: ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

According to Table 32, hypothesis 1 is supported in terms of there is a negative statistically significant relationship between fear of losing family control and influence and firm innovativeness (-.17, p=.043<.05). Therefore, the increase of one unit of fear of losing family control and influence will result in .17 decreases in firm innovativeness. In addition, hypothesis 4 is supported regarding there is a positive statistically significant relationship between fear of losing renewal of family bonds and firm innovativeness (.288, p<.001); the increase of one unit of fear of losing renewal of family bonds will lead to .288 increase in firm innovativeness.

However, hypothesis 2 was not supported because there is no statistically significant relationship between the fear of losing family identity and firm innovativeness (-.121, p=.134>.05). Also, hypothesis 4 is not supported in the current study regarding there is no statistically significant relationship between the fear of losing family binding social ties and firm innovativeness (.014, p=.861>.05).

It is important to note that all the control variable factors have statistically significant relationships with firm innovativeness. (1) There is a positive statistically significant relationship between environmental dynamism and firm innovativeness (.57, P<.001), indicating the increase of one unit of environmental dynamism factor will lead to .57 unit increase in firm innovativeness factor. (2) There is a positive statistically significant relationship between environmental fitness and firm innovativeness (.317, p<.001), demonstrating the increase of one unit of environmental fitness factor will lead to .317 unit increase in firm innovativeness factor. (3) there is a negative statistically significant

relationship between domestic environmental munificence and firm innovativeness (-.127, p=.013<.05), depicting the increase of one unit of domestic environmental munificence factor will lead to .123 decrease in firm innovativeness factor.

In addition, .531 squared multiple correlations (R squared) of firm innovativeness has been explained by the overall factors so that the influence generated by resources are strong.

5.6 MODEL 2: FAMILY FIRM RESOURCES AND FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

This section includes three parts. The first part entails data screening regarding multivariate normality, multicollinearity, testing of the effectiveness of the sample. The second and third parts will include EFA and reliability testing and CFA testing. The SEM results of model 2 will be presented in Section 5.6.4.

5.6.1 DATA SCREENING

5.6.1.1 OUTLIERS

First and foremost, the outliers have been screened by checking the histograms of all the observed variables within model 2 (Blunch, 2013). Figure 21 and Table 33 have shown there are outliers located under the constructs of market knowledge, reputational resources, relational resources, technological resources, human resources, family patient capital and family social capital (circle outliers stay in between the 1.5 interquartile and 3 interquartile range, and asterisk outliers are over 3 interquartile range). Tabachnick and Fidell (2001) suggested two different ways of dealing with outliers. First, it is suggested that the outliers which have exceeded 3 interquartile range could be deleted (Pallant, 2013). Second, researchers can keep outliers. In order to deal with the outliers, the researcher has conducted three ways regarding: (1) defining outliers, (2) comparing the outlier responses with the responses from the other respondents within a firm, and (3) finding out the reason of why the outlier or outliers exist within a particular item.

FIGURE 21: HISTOGRAM OF ALL VARIABLES WITHIN MODEL 2

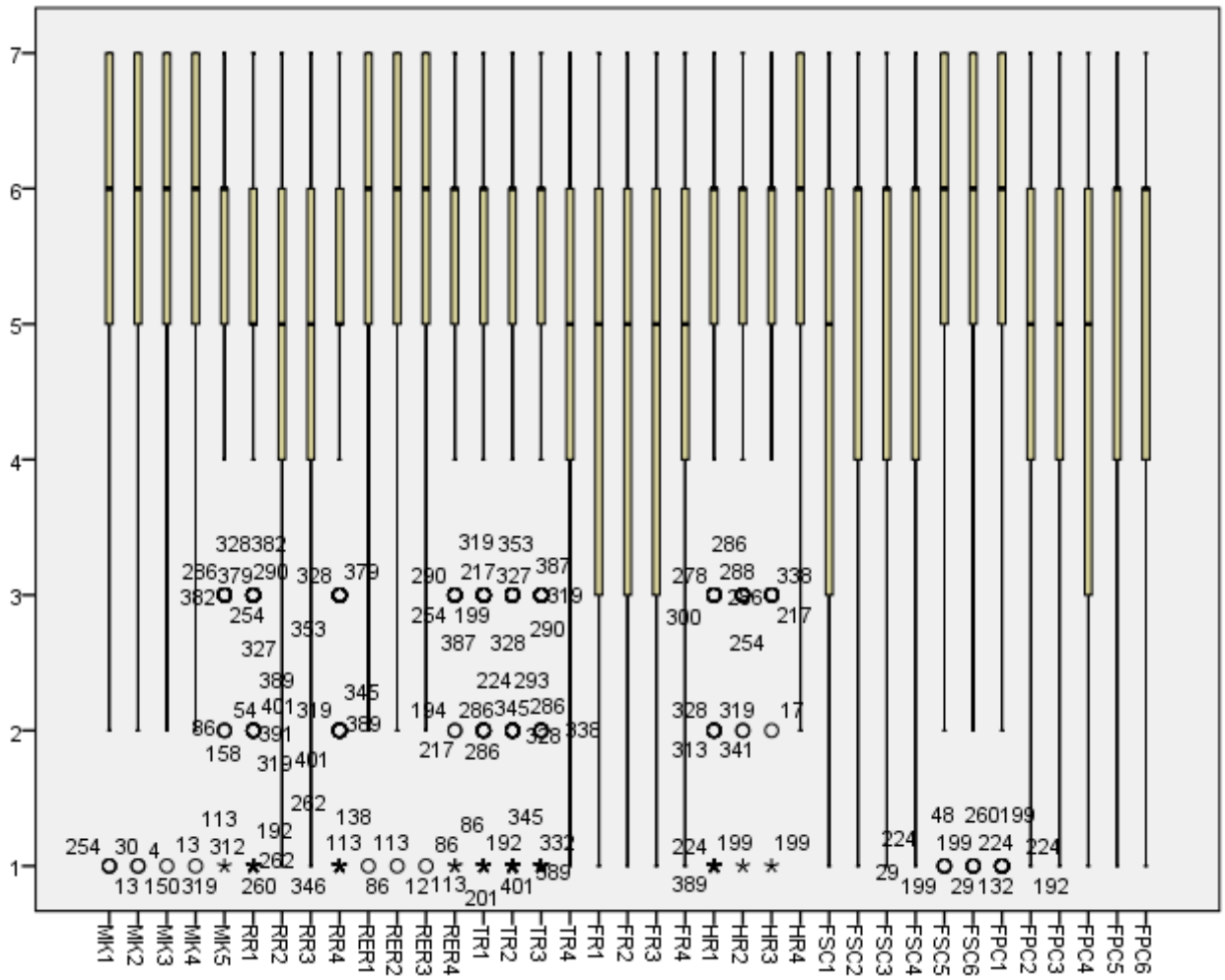


TABLE 33: OUTLIERS AND THEIR CORRESPONDING VARIABLES

Variables names	Variable label	outliers' number
Market knowledge	MK1	30, 13, 254
	MK2	150, 4
	MK3	13
	MK4	113
	MK5	290, 254, 289, 158, 86, 54, 319
Reputational resources	RR1	327, 379, 401, 389, 391, 319, 192, 262, 260
	RR2	no outliers
	RR3	no outliers
	RR4	328, 379, 401, 345, 389, 319, 113, 292, 138
Relational resources	RER1	113
	RER2	86
	RER3	86
	RER4	354, 217, 290, 199, 286, 194, 86, 12
Technological resources	TR1	319, 328, 345, 224, 286, 217, 201, 113, 192
	TR2	290, 253, 319, 338, 293, 328, 286, 332, 389, 345,
	TR3	293, 327, 319, 406, 310, 328, 286, 254, 345, 312
	TR4	no outliers
Financial resources	FR1	no outliers
	FR2	no outliers
	FR3	no outliers
	FR4	no outliers
Human resources	HR1	278, 288, 286, 341, 319, 326, 313, 199, 263, 224,
	HR2	300, 288, 327, 89, 319, 199
	HR3	286, 317, 254, 17, 199
	HR4	no outliers
Family patient capital	FPC1	260, 224, 199, 192
	FPC2	no outliers
	FPC3	no outliers
	FPC4	no outliers
	FPC5	no outliers
	FPC6	no outliers
Family social capital	FSC1	no outliers
	FSC2	no outliers
	FSC3	no outliers
	FSC4	no outliers
	FSC5	224, 199, 48, 29
	FSC6	199, 224, 29, 132
Family owners' Willingness to pursue radical innovation	WRI1	382, 395, 383, 317, 152, 254, 136, 80, 199, 224, 192
	WRI2	382, 395, 383, 201, 289, 251, 193, 80, 199, 224, 192
	WRI3	199, 224, 92, 192
	WRI4	199, 192, 80, 28

It is inadvisable to identify firms' special characters which are different from other firms as the outliers and reject such extreme characters by deleting them (Tabachnick & Fidell, 2001). Because outliers could be the reflection of the real situation in a firm, deleting the firm which has the extreme behaviour would affect the results and assumptions of a study (Pallant, 2013). Two types of outliers can be identified: the 'outlier' which was incorrectly entered by respondents, or by researchers while transforming data from the survey to the SPSS, and the 'outlier' which has shown the speciality of a firm (Tukey, 1977). It is suggestable to delete the former outlier type to increase statistical power and keep the latter one (Hoaglin et al., 1986).

Incorrect data typing was prevented because all the original responses were imported from the Qualtrics platform. The focus is then shifted to compare the similarity of the responses between the two respondents from a firm. This study has gathered all the outliers' numbers from the histogram and then identify the possible reasons for creating the extreme value from the corresponding responses in the SPSS dataset.

For instance, as Figure 21 and Table 33 show, number 254 is one of the outliers in the first item of the market knowledge construct (MK1: knowledge of competitors in the market). It shows the value selected by respondent 254 is much lower than the values which were selected by others. By checking the responses, it is important to note that the firm age is 2 years old, which has demonstrated the corresponding firm is too new to hold a high level of knowledge of the competitors in a market. As the outlier 254 is identified as a reasonable answer, the decision was therefore made to retain the outlier 254.

On the other hand, it is decided to remove the number 13 under the item MK1 because the corresponding response depicts the firm established 10 years ago, which leads the answer of low knowledge of competitors being criticised. Particularity, the firm has met strong competition within the market (checked the answer of competitive intensity), which demonstrates the answer 'low knowledge of their competitors' is unreasonable. For the above reasons, the number 13 was decided to be removed from MK1.

Through the process of identifying the outliers from the histogram, besides the response number 345 in RR4, 12 and 199 in RER 4, and 312 in TR3 were removed, and the rest of the others are retained in model 2. Since the following tests within EFA and CFA will adopt the listwise approach, the deleting of the value from a single item within a construct will not influence the testing results.

5.6.1.2 MULTICOLLINEARITY, MISSING VALUE AND NORMALITY

The collinearity and descriptive statistics were conducted with the listwise approach in terms of the case which has missing value or values being dropped from the analysis (Pallant, 2013). For instance, the responses in number 345 under RR4, number 12 and 199 in RER 4, number 312 in TR3, and number 13 in MK1 have been deleted from the data, resulting in all the other items under the same construct having failed to participate in the analysis. Although the listwise approach renders a decrease in the number of cases entering an analysis, it creates a consistent type of results which are generated from the same number of cases (Blunch, 2013).

TABLE 34: COLLINEARITY AND DESCRIPTIVE STATISTICS

Variables	Constructs	Tolerance	VIF	Valid	Mean	Variance	Skewness	Kurtosis	zskewness	zKurtosis
	MK1	.31	3.19	407	5.72	1.57	-1.27	1.68	-10.48	6.94
	MK2	.30	3.29	407	5.76	1.45	-1.37	1.96	-11.29	8.13
Market knowledge	**MK3**	.25	3.94	407	5.90	1.12	-1.24	2.07	-10.26	8.57
	MK4	.26	3.79	407	5.86	1.12	-1.13	1.40	-9.31	5.80
	MK5	.28	3.60	407	5.72	1.20	-1.12	1.67	-9.25	6.92
	RR1	.26	3.88	407	5.20	2.15	-.94	.69	-7.77	2.84
Reputational	**RR2**	.20	5.11	407	5.07	2.42	-.94	.39	-7.77	**1.62**
resources	**RR3**	.20	4.99	407	5.08	2.29	-.99	.59	-8.16	2.43
	RR4	.26	3.79	407	5.21	2.20	-1.01	.66	-8.32	2.72
	RER1	.28	3.57	407	5.86	1.06	-1.18	1.95	-9.75	8.07
Relational	**RER2**	.23	4.36	407	5.88	1.11	-1.21	2.07	-9.97	8.56
resources	**RER3**	.21	4.86	407	5.85	.99	-1.15	2.37	-9.49	9.82
	RER4	.21	4.79	407	5.81	1.08	-1.27	2.32	-10.51	9.59
	TR1	.33	3.03	407	5.44	1.95	-1.26	1.31	-10.40	5.44
Technological	**TR2**	.25	3.95	407	5.25	2.82	-1.20	.62	-9.91	2.56
resources	**TR3**	.25	3.94	407	5.32	2.47	-1.30	1.12	-10.77	4.63
	TR4	.45	2.23	407	4.96	3.45	-1.00	-.05	-8.25	**-.22**
	FR1	.21	4.80	407	4.57	3.04	-.47	-.80	-3.84	-3.33
Financial	**FR2**	.15	6.73	407	4.60	3.05	-.40	-.84	-3.33	-3.50
resources	**FR3**	.27	3.67	407	4.33	3.22	-.27	-.95	-2.26	-3.94
	FR4	.29	3.43	407	4.79	2.86	-.64	-.58	-5.31	-2.39
	HR1	.36	2.79	407	5.37	1.79	-1.28	1.82	-10.54	7.56
Human resources	**HR2**	.24	4.19	407	5.75	1.10	-1.16	1.85	-9.57	7.66
	HR3	.18	5.58	407	5.79	1.05	-1.19	2.03	-9.82	8.41
	HR4	.19	5.29	407	5.90	.89	-.98	1.31	-8.10	5.41
	FPC1	.44	2.29	407	5.43	2.16	-1.01	.59	-8.31	2.44
	FPC2	.32	3.18	407	4.99	2.93	-.65	-.62	-5.35	-2.56
Family patient	**FPC3**	.36	2.77	407	4.99	2.89	-.80	-.27	-6.61	**-1.12**
capital	**FPC4**	.25	4.07	407	4.80	2.98	-.45	-.94	-3.75	-3.91
	FPC5	.30	3.31	407	5.09	2.53	-.78	-.29	-6.41	**-1.19**
	FPC6	.30	3.37	407	5.16	2.48	-.91	.01	-7.54	**.03**
	FSC1	.38	2.61	407	4.56	3.47	-.31	-1.15	-2.55	-4.75
	FSC2	.37	2.70	407	5.26	2.36	-.86	.05	-7.14	**.21**
Family social	**FSC3**	.40	2.54	407	4.89	3.48	-.71	-.66	-5.83	-2.74
capital	**FSC4**	.30	3.29	407	5.22	2.40	-.80	-.19	-6.62	**-.80**
	FSC5	.26	3.81	407	5.64	1.86	-1.26	1.43	-10.40	5.94
	FSC6	.31	3.28	407	5.66	1.72	-1.32	1.92	-10.87	7.97

Based on the criteria for detecting multicollinearity among independent variables, multicollinearity exists when the tolerance level is less than .1 and VIF is higher than 9. According to the results presented in Table 34, there is no multicollinearity in model 2.

Since the listwise approach is adopted, removing the 5 outliers have caused the 5 corresponding cases not to join the further EFA and CFA analysis. In particular, the 5 cases would be less likely to generate a big impact on the results under a large sample (N>300) in the current study.

In addition, normality analysis has demonstrated all the variables have a certain degree of skewness and kurtosis because all the Z-scores of skewness under model 2 variables have exceeded the ±1.96 range, and only 7 Z-scores stay in the ±1.96 range (Table 34). Thus, all the items are non-normality distributed.

Because of the online questionnaire was constructed as force responses, responses could not be uploaded onto the Qualtrics if respondents leave a single question incomplete. Thus, there are no missing values among the constructs in model 2.

5.6.2 EFA RESULTS FOR MODEL 2

Like EFA analysis structure in model 1, the EFA for model 2 will conduct the principal components analysis for all independent variables to ensure the items which have shared the same concept could be mapped to the same domain (e.g. MK1 – MK5 are mapped mainly under market knowledge domain) (Table 35), and then for each latent independent variable and each control variable in order to ensure all the construct measures are unidimensional structured. The internal consistencies (Cronbach's Alpha coefficient) of each construct will be presented in Table 36.

5.6.2.1 EFA RESULTS: FAMILY FIRM RESOURCES

TABLE 35: EFA RESULTS FOR FAMILY FIRM RESOURCES IN MODEL 2

N=407										
Variables	Variable label	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	communalities
Market knowledge	MK1				.62					.71
	MK2				.67					.72
	MK3				.73					.81
	MK4				.70					.76
	MK5				.69					.78
Reputational resources	RR1		.78							.81
	RR2		.85							.88
	RR3		.85							.87
	RR4		.82							.83
Relational resources	RER1			.75						.79
	RER2			.79						.83
	RER3			.79						.84
	RER4			.72						.80
Technological resources	TR1							.53		.69
	TR2							.82		.84
	TR3							.80		.83
	TR4							.69		.64
Financial resources	FR1					.82				.81
	FR2					.86				.88
	FR3					.76				.79
	FR4					.77				.75
Human resources	HR1						.68			.73
	HR2						.82			.85
	HR3						.80			.86
	HR4						.79			.84
Family social capital	FSC1	.68								.68
	FSC2	.73								.68
	FSC3	.72								.70
	FSC4	.78								.75
	FSC5	.78								.78
	FSC6	.76								.74
Family patient capital	FPC2								.74	.77
	FPC3								.80	.76
	FPC4								.82	.85
Eigenvalues		14.42	3.22	2.51	1.84	1.38	1.31	1.12	1.02	
Cumulative Percentage of Total Variance		12.32%	22.85%	33.37%	43.54%	53.37%	62.89%	71.05%	78.32%	
KMO and Bartlett's Test										
Kaiser-Meyer-Olkin Measure =. 778										
Bartlett's Test of Sphericity (Approx. Chi-Square=1273.163; df=666; sig.=.000)										

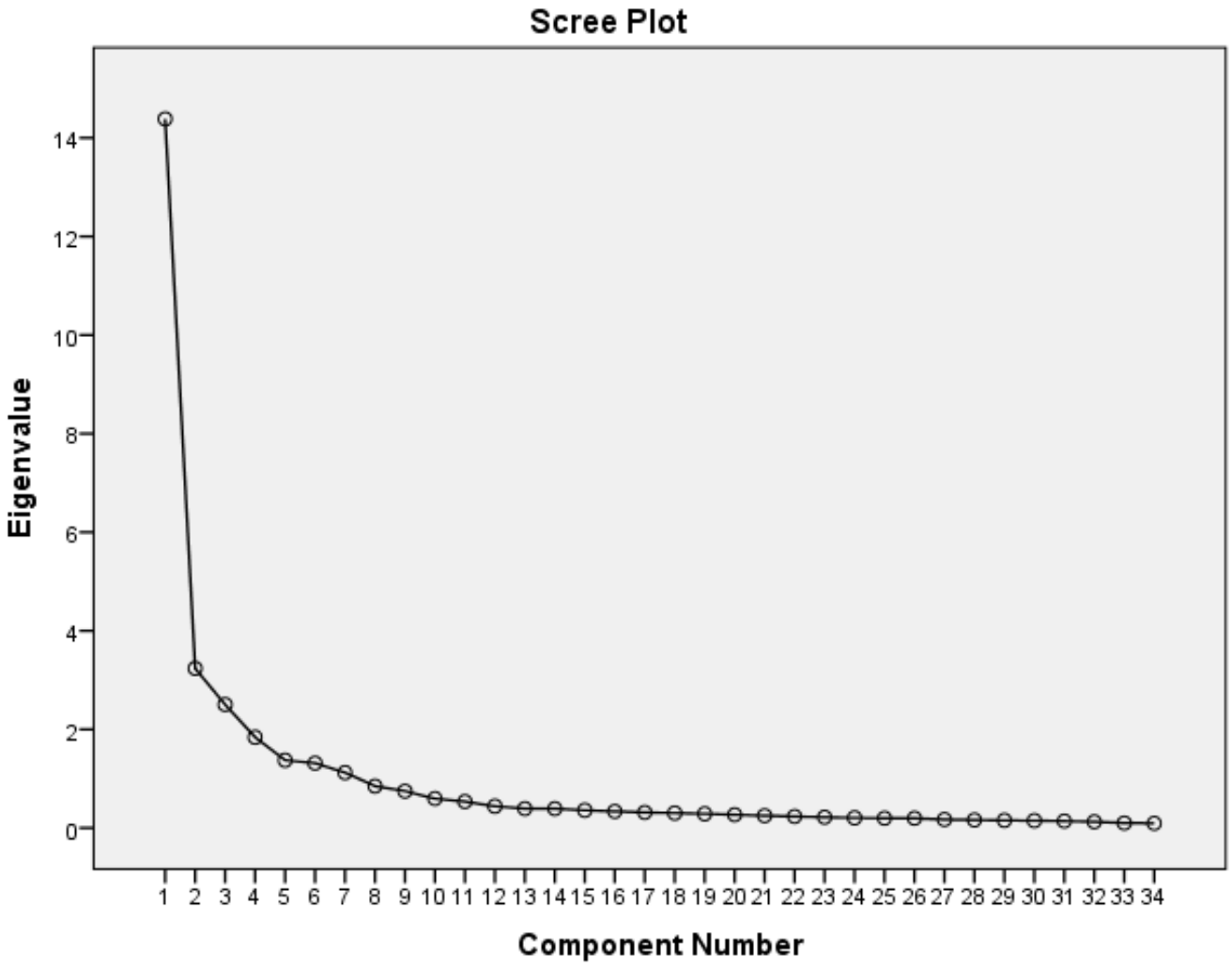
Note. ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

The EFA verified the items within the measure of family firm resources (Table 35). FPC1, FPC4 and FPC6 showed the cross-loading on other factors and then were deleted from the EFA. The KMO and Bartlett's tests results are shown at the top of Table 35. As the rule of thumb mentioned, the KMO value should not less than .6 (Blunch, 2013). The results of the current EFA show the KMO is .778 which is larger than the threshold of .6, demonstrating the testing variables have been largely explained by the underlying factors.

On the other hand, Bartlett's test of sphericity is significant ($p<.001$) in the current study. It illustrates the correlation matrix has a significant correlation among some of the variables that can further demonstrate the factor analysis is appropriate. Principle components analysis demonstrates 8 components with eigenvalue exceeding 1, from 1.02 to 14.42, capturing 78.32% of total variances. The number of factors extracted from the EFA can match the number of constructs within model 2. Finally, all the factor loadings exceeded .53 which has exceeded the threshold of .4; and the communalities values have shown a high percentage of shared (common) variance (over 67.7%) which exceed the threshold of .3 (Hosany et al., 2006) (Table 35).

However, according to Figure 22, the 'elbow break' is difficult to identify, which could be either between 7 and 8 or between 9 and 10. In this case, it is decided to select Kaiser's eigenvalue-greater-than-one rule as the reference to extract the factors (Hair et al., 2006).

FIGURE 22: SCREE PLOT OF FAMILY FIRM RESOURCES



5.6.2.2 EFA RESULTS FOR EACH FACTOR WITHIN FAMILY FIRM RESOURCES

TABLE 36: EFA RESULTS FOR EACH CONSTRUCT

Constructs		Factor loading	Commonalities	Eigenvalue	KMO	Bartlett's test	Cumulative variance %
Market Knowledge	**MK1**	.856	.733	3.881	.891	P<.001	77.616
	MK2	.870	.757				
	MK3	.907	.822				
	MK4	.881	.777				
	MK5	.890	.792				
Reputational resources	**RR1**	.901	.812	3.362	.852	P<.001	84.046
	RR2	.936	.875				
	RR3	.925	.856				
	RR4	.905	.818				
Relational resources	**RER1**	.895	.801	3.354	.850	P<.001	83.857
	RER2	.921	.848				
	RER3	.927	.859				
	RER4	.919	.845				
Technological resources	**TR2**	.926	.858	2.370	.696	P<.001	78.988
	TR3	.903	.816				
	TR4	.834	.696				
Financial resources	**FR1**	.894	.798	3.177	.785	P<.001	79.413
	FR2	.932	.869				
	FR3	.889	.790				
	FR4	.848	.719				
Human resources	**HR2**	.929	.863	2.649	.764	P<.001	88.307
	HR3	.945	.894				
	HR4	.944	.892				
Family patient capital	**FPC2**	.829	.888	2.405	.714	P<.001	80.163
	FPC3	.810	.870				
	FPC4	.844	.928				
Family social capital	**FSC1**	.802	.644	3.996	.852	P<.001	66.605
	FSC2	.835	.698				
	FSC3	.788	.621				
	FSC4	.870	.757				
	FSC5	.820	.672				
	FSC6	.778	.605				

According to Table 36, all the loadings from the items have exceeded the critical value (.4). The KMO value of these variables has exceeded .6. The least KMO value is .696 for technological resources that is greater than the threshold of .6, and the highest KMO value is .891 from market knowledge. Besides all Bartlett's tests have met the significant value, the cumulated variance of each factor has exceeded 60%. Lastly, every single factor is unidimensional, demonstrating an appropriate condition for conducting CFA.

5.6.2.3 RELIABILITY ANALYSIS

Since model 1 and model 2 are sharing the same control variables which are environmental dynamism, environmental fitness and domestic environmental munificence, and the internal consistency analysis has been adopted for the three control variables above, the reliability analysis will view the internal consistency of the independent and dependent variables constructs by using the Cronbach's alpha coefficient within SPSS. Based on the rule of thumb, Cronbach's alpha should greater than .7 in order to demonstrate an acceptable internal consistency of a construct (Tabachnick & Fidell, 2001). The testing results of the reliability analysis of the constructs are listed below.

TABLE 37: INTERNAL CONSISTENCY OF THE LATENT CONSTRUCTS WITHIN MODEL 1

Constructs	Items	Corrected item-total correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Market knowledge	MK1	.770	.904	.917
	MK2	.764	.904	
	MK3	.838	.890	
	MK4	.778	.901	
	MK5	.808	.895	
Reputational resources	RR1	.828	.926	.938
	RR2	.883	.908	
	RR3	.864	.914	
	RR4	.832	.925	
Relational resources	RER1	.806	.912	.926
	RER2	.847	.898	
	RER3	.856	.896	
	RER4	.809	.911	
Technological resources	TR1	.636	.855	.863
	TR2	.821	.777	
	TR3	.812	.784	
	TR4	.609	.858	
Financial resources	FR1	.806	.888	.914
	FR2	.869	.865	
	FR3	.800	.890	
	FR4	.742	.909	
Human resources	HR1	.661	.886	.897
	HR2	.837	.845	
	HR3	.846	.843	
	HR4	.822	.857	
Family social capital	FSC1	.714	.873	.89
	FSC2	.754	.864	
	FSC3	.699	.876	
	FSC4	.791	.858	
	FSC5	.702	.874	
	FSC6	.648	.881	
Family patient capital	FPC2	.746	.838	.876
	FPC3	.716	.864	
	FPC4	.823	.767	
family owners' Willingness to pursue radical innovation	WRI1	.763	.930	.933
	WRI2	.875	.897	
	WRI3	.885	.893	
	WRI4	.829	.912	

Note. Cronbach's alpha test was taken individually for each construct; Recommended Cronbach's alpha is .7.

According to Table 37, there are 9 measures which have excellent internal consistency results: reputational resources (α =.938), family owners' willingness to pursue radical innovation (α=.933), relational resources (α =.926), market knowledge (α=.917), financial

resources (α=.914), human resources (α=.897), family social capital (α=.89), family patient capital (α=.876), and technological resources (α=.863). In addition, the Cronbach's alpha for domestic environmental munificence is .89, environmental fitness is .948, and environmental dynamism is .925 showing an excellent internal consistency (Table 23 in Section 5.5.3). All 9 measures are excellent and far above the threshold of .7.

5.6.3 CFA RESULTS FOR MODEL 2

The EFA results show 8 factors have eigenvalue greater than 1 and were extracted among the observed variables which were set to, respectively, measure market knowledge, reputational resource, relational resources, financial resources, human resources, technological resources, family patient capital and family social capital after rotation. In the current circumstance, the number of factors has matched the number of constructs. EFA has successfully verified the model 2 independent constructs without restricted by model 2 hypotheses.

In this section, CFA will bring into the data analysis to further specify the exact correspondence between indicators and factors by following the hypothesis, and estimate whether the particular variance is shared between certain pairs of indicators (Kline, 2016). In the beginning, it will test the model identification, convergent validly, discriminant validity and common method bias in order to create a favourable context for running the CFA of model 1. The results for the model fit will be presented at the end of this section.

5.6.3.1 MODEL IDENTIFICATION

There are 39 observed variables within model 2, with 78 number of variances (39 variables + 39 error terms), 4 regression coefficients between exogenous variables and endogenous variable, and 12 covariances among the module constructs. Following the formula above, the df of model 2 is 679, showing model 2 is an over-identified model in which the multi-solutions are expected in CFA.

5.6.3.2 CONVERGENT VALIDITY

This section will start with single dimensional CFA too, first, view the factor loadings are appropriate (>.4) between indicators and factors, and, second, utilize the weights (standardized and unstandardized) to calculate the average variance extracted (AVE) and composite reliability (CR). The average variance extracted statistics (AVE) and composite reliability (CR) results of the all constructs of model 2 are shown below.

TABLE 38: MODEL FIT OF EACH CONSTRUCT AND WEIGHT ESTIMATES (FACTOR LOADINGS)

Constructs	Items	unstandardized Weight Estimates	Standardized Weight Estimates	Model fit
Market knowledge	MK1	1	.79	CMIN=9.138 (CMIN/DF = 2.285), p=.058 > .05, NFI = .994, CFI= .997, RMSEA = .056
	MK2	.952	.78	
	MK3	.943	.896	
	MK4	.913	.847	
	MK5	.935	.856	
Reputational resources	RR1	.875	.859	CMIN=12.680 (CMIN/DF = 6.34), p=.002 <.05, NFI = .991, CFI= .993, RMSEA = .114
	RR2	1	.927	
	RR3	.956	.909	
	RR4	.895	.862	
Relational resources	RER1	.908	.819	CMIN=1.038 (CMIN/DF = 1.038), p=.308 >.05, NFI = .999, CFI= 1, RMSEA = .010
	RER2	.979	.864	
	RER3	.988	.923	
	RER4	1	.871	
Technological resources	TR1	.748	.76	Just-identified model
	TR2	.993	.853	
	TR3	1	.914	
	TR4	.827	.639	
Financial resources	FR1	.91	.891	CMIN=3.176 (CMIN/DF = 3.176), p=.075 > .05, NFI = .998, CFI= .998, RMSEA = .073
	FR2	1	.979	
	FR3	.803	.764	
	FR4	.698	.705	
Human resources	HR1	1	.716	CMIN=3.709 (CMIN/DF = 3.709), p=.054 > .05, NFI = .997, CFI= .998, RMSEA = .081
	HR2	.961	.886	
	HR3	.97	.917	
	HR4	.899	.923	
Family social capital	FSC1	1	.776	CMIN=21.884 (CMIN/DF = 2.736), p=.005 < .05, NFI = .986, CFI= .991, RMSEA = .065
	FSC2	.884	.831	
	FSC3	.987	.764	
	FSC4	.926	.864	
	FSC5	.654	.694	
	FSC6	.571	.628	
Family patient capital	FPC2	.932	.826	Just-identified model
	FPC3	.868	.774	
	FPC4	1	.877	
family owners' Willingness to pursue radical innovation	WRI1	.796	.774	CMIN=.002(CMIN/DF = .002), p=.963 >.05, NFI = 1, CFI=1, RMSEA < .001
	WRI2	.919	.901	
	WRI3	1	.95	
	WRI4	.951	.877	
Environmental dynamism	EnD1	.798	.81	Just-identified model
	EnD2	1	.98	
	EnD3	.932	.903	
Environmental	EnF1	.956	.854	CMIN=.25.13 (CMIN/DF

fitness	EnF2	.978	.899	= .5.026), p <.001, NFI = .978, CFI= .99, RMSEA = .099
	EnF3	.982	.884	
	EnF4	.964	.849	
	EnF5	1	.9	
Domestic environmental munificence	DoM1	.932	.839	
	DoM2	1	.909	Just-identified model
	DoM3	.843	.815	

To better view the weights, the strongest weight of each factor has been constrained to 1 (Blunch, 2013). All 12 factors show the excellent factor loadings with the minimum loadings above .7 for both unstandardized and standardized weights (Table 38).

TABLE 39: CONVERGENT VALIDITY

Variables	AVE	CR
Market knowledge	.70	.92
Reputational resources	.79	.94
Relational resources	.77	.93
Technological resources	.69	.87
Financial resources	.72	.91
Human resources	.83	.93
Family patient capital	.60	.90
Family social capital	.60	.90
Environmental dynamism	.81	.93
Environmental fitness	.79	.95
Domestic environmental munificence	.73	.89
Family owners' willingness to pursue radical innovation	.78	.93

Note. AVE (average variance extracted) and CR (composite reliability), Recommended AVE is .5 and CR is .7

All the constructs have shown good AVE score which is higher than the critical value of .5 and CR score which is higher than the critical value of .7. AVE is ranging from .6 to .811, and CR is ranging between .869 and .938 (Table 39). To conclude, all the constructs have demonstrated good convergent validity.

5.6.3.3 DISCRIMINANT VALIDITY

TABLE 40: DISCRIMINANT VALIDITY

Variables	AVE	MK	RR	RER	TR	FR	HR	FPC	FSC	EnD	EnF	DoM
MK	.70											
RR	.79	.354										
RER	.77	.684	.259									
TR	.69	.382	.354	.297								
FR	.72	.231	.228	.161	.235							
HR	.83	.456	.187	.410	.205	.214						
FPC	.60	.248	.176	.236	.160	.205	.294					
FSC	.60	.284	.161	.269	.105	.240	.241	.514				
EnD	.81	.176	.105	.158	.082	.149	.221	.581	.428			
EnF	.79	.017	.073	.008	.082	.198	.003	.009	.001	.007		
DoM	.73	.033	.078	.009	.040	.052	.008	.000	.003	.002	.303	
WRI	.78	.252	.128	.247	.124	.144	.251	.531	.498	.484	.0004	.002

Note. Recommend discriminant validity is AVE > squared correlations between variables); AVE≥ .5

MK=Market knowledge
RR=Reputational resources
RER=Relational resources
TR=Technological resources
FR=Financial resources
HR=Human resources
FPC=Family patient capital
FSC=Family social capital
EnD=Environmental dynamism
EnF=Environmental fitness
DoM=Domestic environmental munificence
WRI= Family owners' willingness to pursue radical innovation

According to the rule of thumb for identifying the violation of discriminant validity, the AVE score should be higher than the squared correlation (Blunch, 2013). In Table 40, AVE scores of the model 2 constructs are presented. The factor correlation for each relationship was demonstrated in the factor correlation column, and the squared factor correlation was located in the correlation squared column. Based on the results (Table 40), all the AVE scores are larger than their corresponded squared correlation. Therefore, there is no violation of the assumption of discriminant validity.

5.6.3.4 COMMON METHOD VARIANCE

CMV was verified in two ways – CFA marker analytic technique (Lindell & Whitney, 2001) and Harman's one-factor test (Podsakoff et al., 2003). Like model 1 CMV analysis, the selected marker variable is radical innovation education (RIE) which is theoretically unrelated to the focus model 2 variables which are associated with family firm resources. In addition, RIE is a latent variable which has a similar structure (7-point Likert scale) to other focus independent variables in model 2. As mentioned by Lindell and Whitney (2001), CMV associated to consistency motif and implicit theory will be unlikely if there is no statistically significant relationship between the marker variable and other focus variables within the model 2.

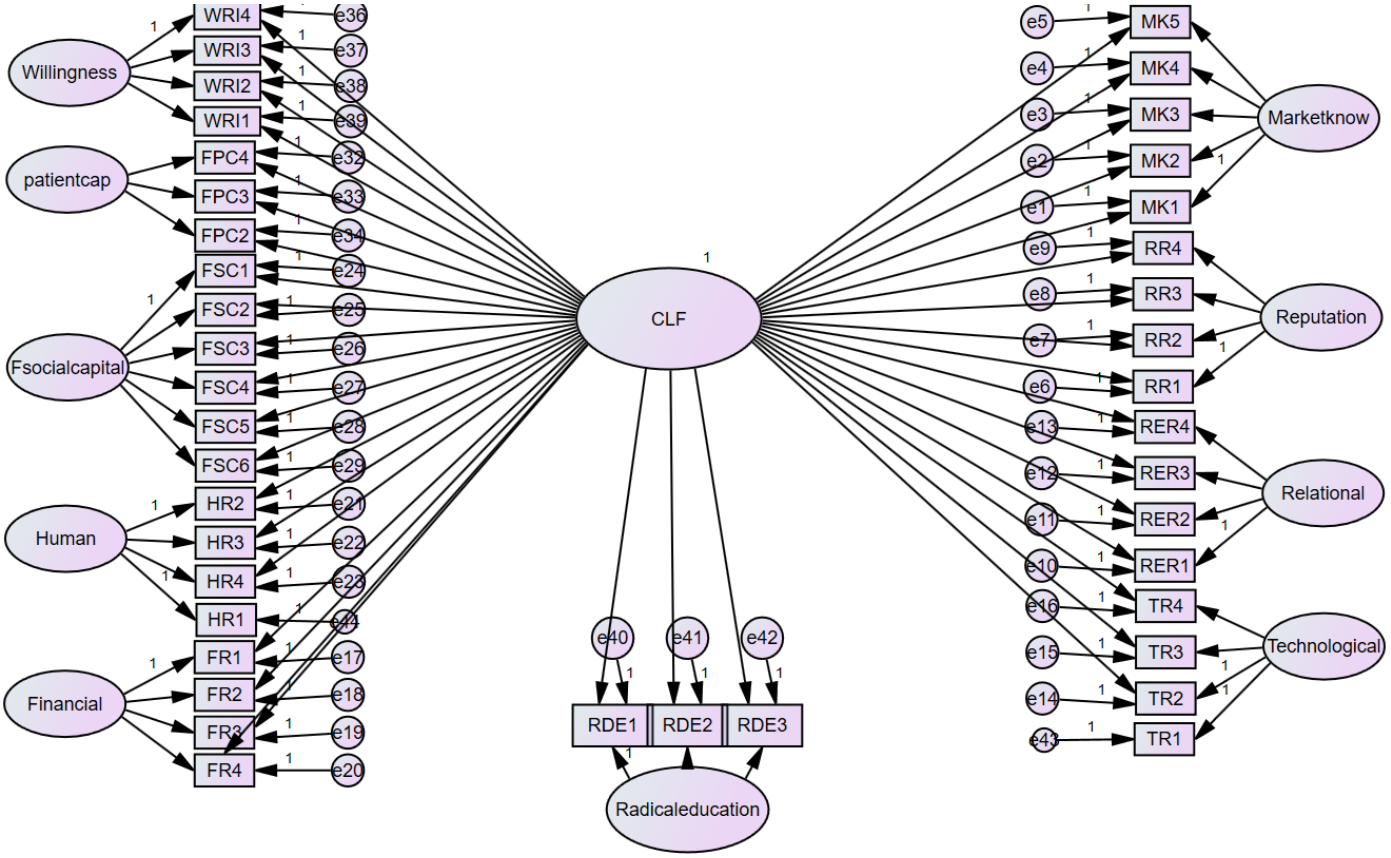
TABLE 41: CORRELATIONS BETWEEN RADICAL INNOVATION EDUCATION AND MODEL 2 CONSTRUCTS

Correlations: Radical innovation education and constructs of model 2		
Variables	Sig. (2-tailed)	Pearson Correlation
Family owners' willingness to pursue radical innovation	.353	.046
Market Knowledge	.459	.037
Reputational resources	.759	.015
Relational resources	.569	.028
Technological resources	.725	.018
Financial resources	.665	.022
Human resources	.478	.035
Family social capital	.921	-.005
Family patient capital	.871	-.008

Note. Significant level: ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

According to Table 41, the correlations between the marker variable and the focus variables in model 2 were insignificant (-.008 <b<.046, p>.353). It shows that model 2 constructs (independent variable constructs and dependent variable construct) have no CMV issue regarding consistency motif and implicit theory.

FIGURE 23: CFA MARKER TECHNIQUE TO VERIFY CMV



In Figure 23, a common latent factor (CLF) was created and then connected to the overall observed variables (observed variables from substantive variables and observed variables from the marker variable – RIE) in the model by using direct paths, for the purpose of observing the shared (common) variance among the variables. In Figure 23, the covariance exists across all the exogenous factors, but the covariance arrows do not show in this figure due to the reason for clearer presentation. The results show the shared weights are .16 that indicate the shared variance is 2.56% (.16 * .16 = .0256), demonstrating that the RIE shared 2.56% variance with the substantive variables. According to the threshold level of 50% of the total variance mentioned by Podsakoff et al. (2003), the CMV is low and states at an acceptable level.

TABLE 42: HARMAN'S ONE-FACTOR TESTS

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared		
	Total	% of	Cumulative %	Total	% of	Cumulative %
1	16.181	41.489	41.489	16.181	41.489	41.489
2	3.964	10.164	51.652			
3	2.510	6.435	58.088			
4	1.784	4.576	62.663			
5	1.648	4.225	66.888			
6	1.358	3.481	70.370			
7	1.287	3.299	73.669			
8	1.020	2.615	76.284			
9	.840	2.155	78.438			
10	.723	1.854	80.292			
11	.686	1.758	82.051			
12	.568	1.457	83.508			
13	.470	1.204	84.712			
14	.424	1.086	85.798			
15	.395	1.014	86.812			
16	.392	1.005	87.817			
17	.367	.942	88.759			
18	.336	.862	89.621			
19	.326	.836	90.457			
20	.309	.792	91.249			
21	.283	.726	91.975			
22	.268	.686	92.661			
23	.253	.649	93.309			
24	.241	.618	93.927			
25	.228	.586	94.513			
26	.214	.550	95.063			
27	.201	.515	95.577			
28	.197	.506	96.084			
29	.188	.481	96.565			
30	.177	.454	97.020			
31	.170	.436	97.456			
32	.160	.411	97.867			
33	.150	.385	98.252			
34	.145	.373	98.625			
35	.140	.358	98.983			
36	.115	.294	99.278			
37	.101	.258	99.535			
38	.096	.247	99.783			
39	.085	.217	100.000			

Note. Recommended cumulative variance should be less than 50%

Based on Harman's one-factor analysis, it also shows the variance of the first component is 41.489% which is a seemingly large variance out of the total variance (Table 42). However, the results do not exceed the threshold level of 50% of the total variance (Podsakoff et al., 2003). Therefore, under Harman's one-factor test, the CMV states at an acceptable level.

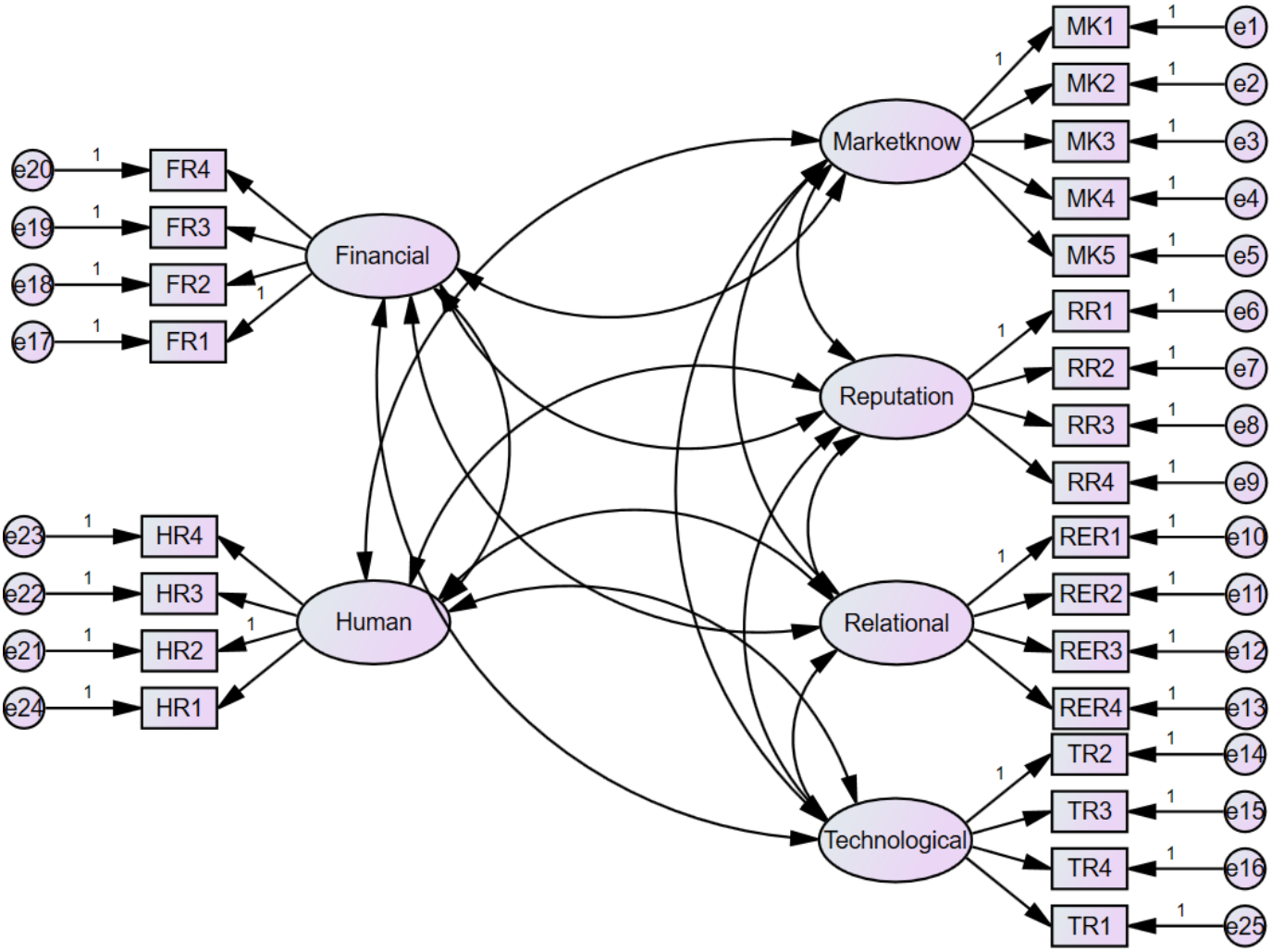
5.6.3.5 RESULTS OF MODEL FIT

In order to create the model with the best fit, the CFA will start to view the fit of independent variables, then the fit of both dependent and independent variables and, lastly, the fit of the independent, dependent and control variables overall (Kline, 2016). The CFA Maximum Likelihood estimation of model 1 will be presented in two different models: (1) model A will

include measures relating to independent variables (market knowledge, reputational resource, relational resource, technological resources, financial resource, human capital patient capital and social capital); (2) model B will include measures regarding the dependent variable (family owners' willingness to pursue radical innovation) and independent variables.

5.6.3.5.1 Model Fit of Model A1

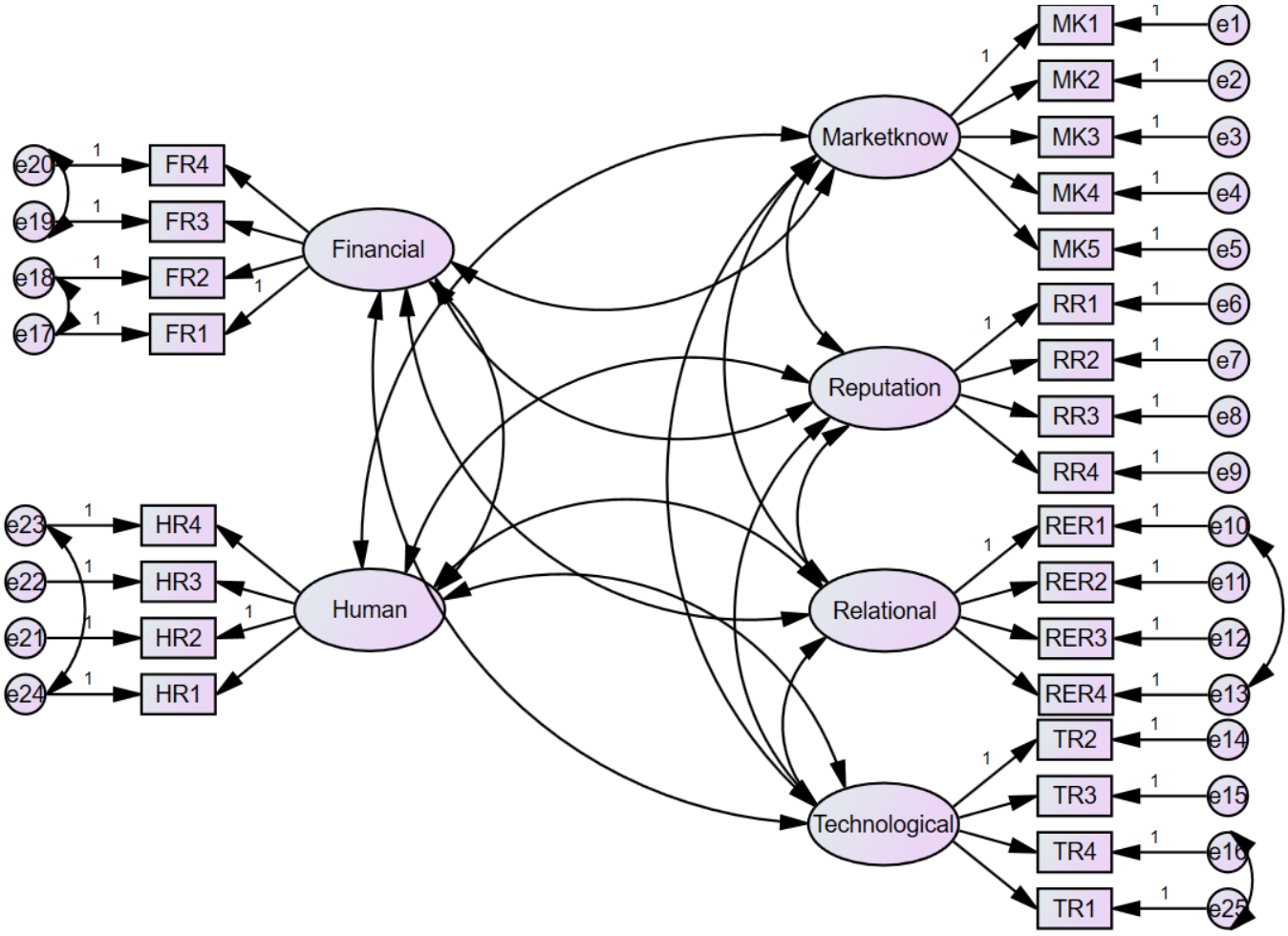
FIGURE 24: MODEL A1: MARKET RESOURCES (INITIAL MODEL)



Model A1 was initially constructed in terms of connecting all the latent factors (financial resources, human resources, market knowledge, reputational resources, relational resources, and technological resources) by covariance paths (Figure 24). The results of the CFA Maximum Likelihood estimation show that: CMIN=845.608 (CMIN/DF=3.252), p<.001, NFI=.91, CFI=.936, RMSEA= .074, PCLOSE < .001, 95%CI (.069, .08), Standardized RMR = .0612.

The initial results have demonstrated a moderate model fit. First, CMIN is significant in showing the exact fitting model is rejected, and CMIN/DF is between 3 and 5 providing a moderate fit. Second, both NFI and CFI are less than .95 indicating a fair model fit. In addition, both RMSEA and Standardized RMR are between 6 and 8 indicating a moderate fit. The current model fit indices indicate the model fit of the initial model is moderate.

FIGURE 25: MODEL A1: MARKET RESOURCES (IMPROVED MODEL)

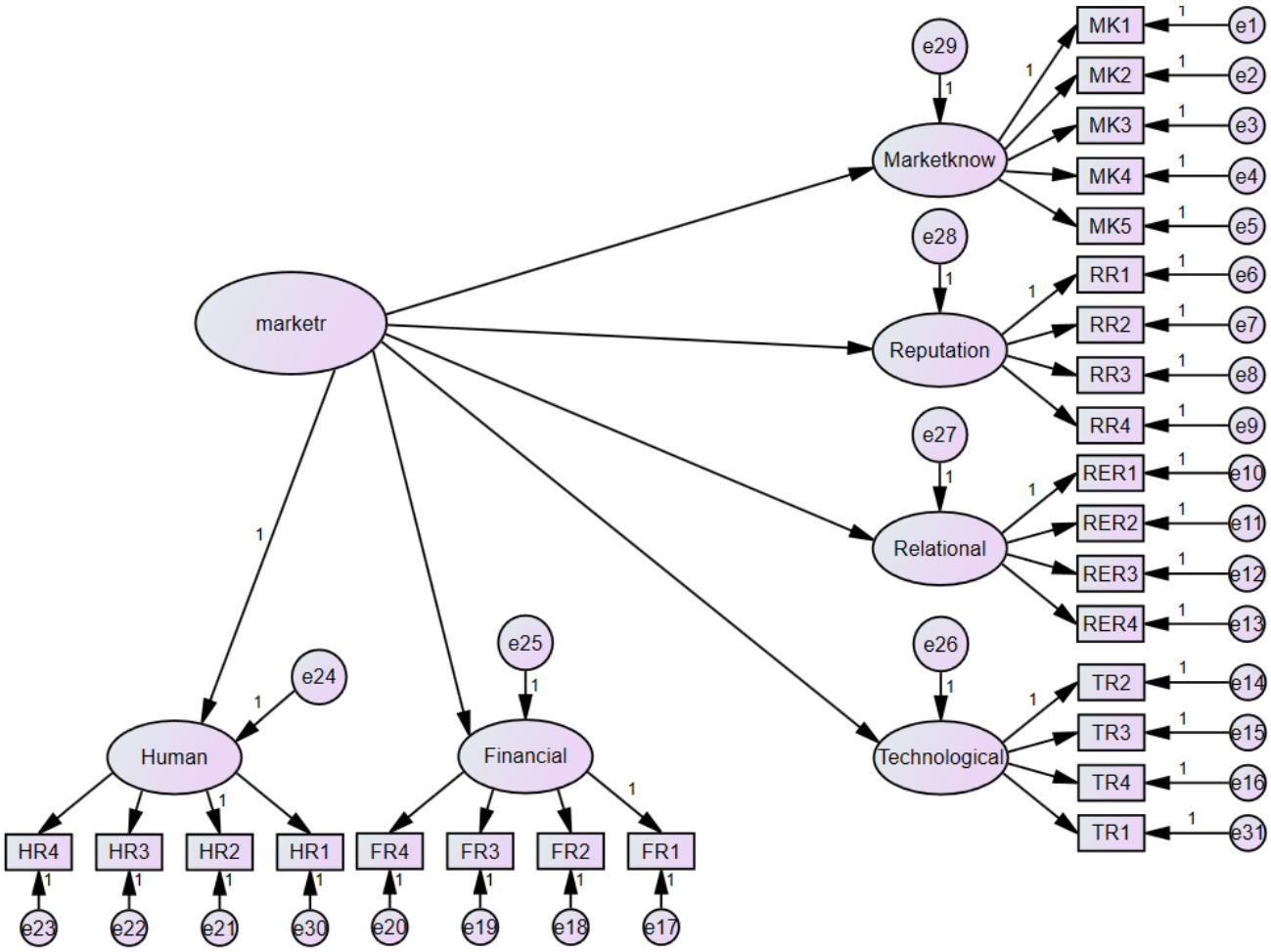


Following the modification indices, the strong correlations among the model A1 components have been identified – e19 and e 20 (MI=58.926), e16 and e25 (MI= 33.777), e17 and e18 (MI=16.14), e23 and e24 (MI=13.492), and e10 and e13 (MI=12.163). After the covariance paths have added between the components mentioned above (Figure 25), the CFA Maximum Likelihood estimation shows that: CMIN=651.794 (CMIN/DF=2.556), p<.001, NFI=.931, CFI=.956, RMSEA=.062, PCLOSE=.001<.05, 95% CI (.056, .068), Standardized RMR =.048

Based on the criteria of assessing the quality of model fit, (1) CMIN is significant (p<.001), showing the exact fitting model (H0) will be rejected; (2) RMSEA is significant (PCLOSE<.001) which demonstrates the close-fitting model (H0) can be rejected; (3) 95%

confident intervals (CI) of RMSEA is ranging between .056 and .068 (the large number has not exceeded .1) showing the poor fitting model will be rejected; (4) the results of NFI is less than .95, but CFI is greater than .95 which have shown good quality of model fit; (5) Standardized RMR (SRMR) is .048 lower than .5 demonstrating the good quality model fit; (6) the chi-square per degree of freedom (CMIN/DF) is 2.556 which is close to 2, showing the good quality of model fit. In conclusion, the improvement of model A1 has a good quality of model fit.

FIGURE 26: MODEL A1: MARKET RESOURCES (INITIAL SECONDARY FACTOR MODEL)

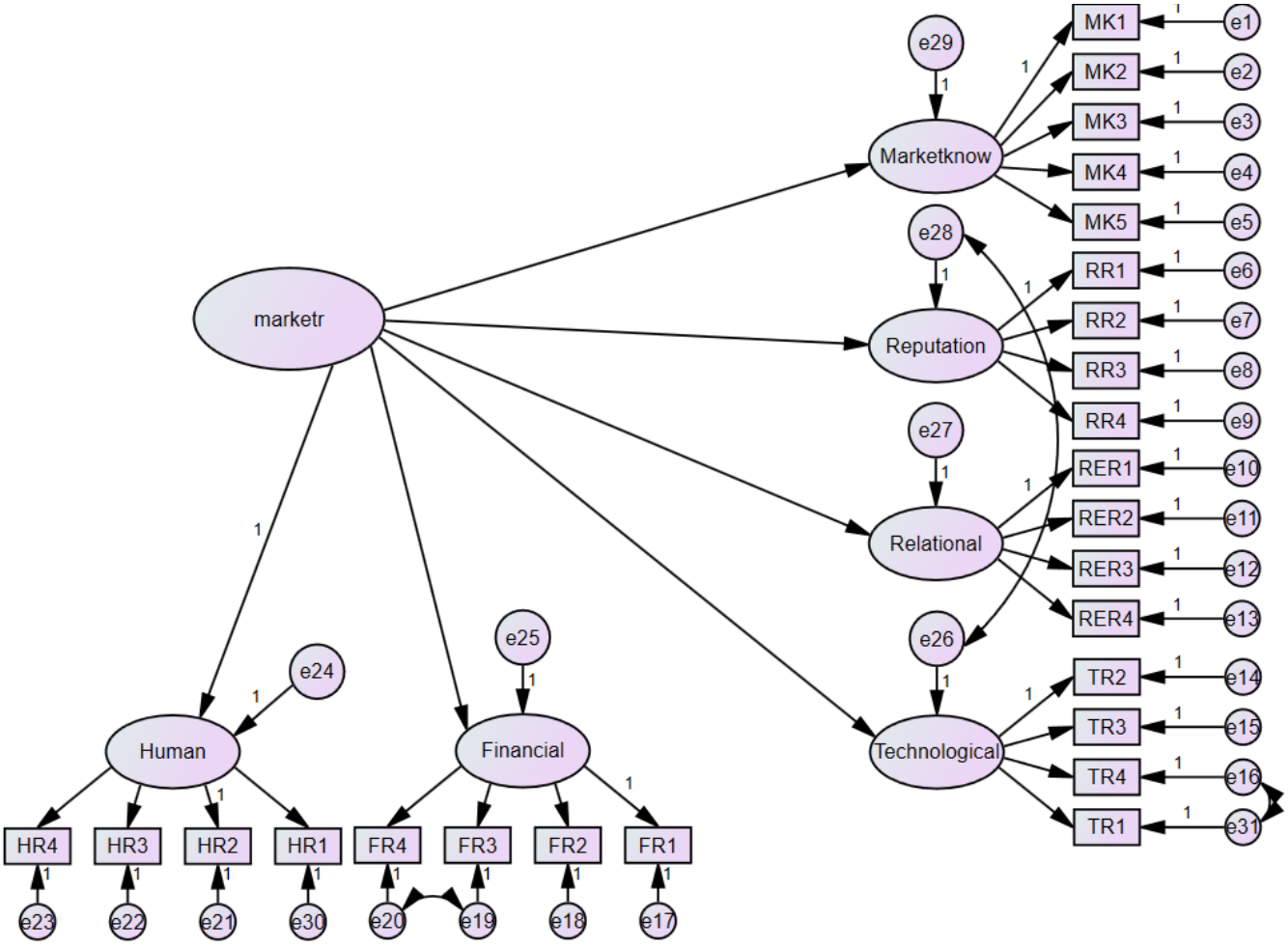


As human resources, financial resources, market knowledge, reputational resources, relational resources and technological resources are market resources (Morgan et al., 2006), another form of model A1 was constructed as a secondary model regarding building up a market resources factor and then connecting the market resources factor to all the latent factors (financial resources, human resources, market knowledge, reputational resources, relational resources, and technological resources) by using direct paths (Figure 26). The results of the CFA Maximum Likelihood estimation show that: CMIN=841.204 (CMIN/DF=3.139), p<.001, NFI=.911, CFI=.937, RMSEA= .073, PCLOSE < .001, 95%CI (.067, .078), Standardized RMR = .0785.

The initial results of the secondary model A1 have demonstrated a moderate model fit. First, CMIN is significant in showing the exact fitting model is rejected, and CMIN/DF is between 3 and 5 providing a moderate fit. Second, both NFI and CFI are lower than .95 indicating a moderate level of model fit. In addition, both RMSEA and Standardized RMR are between 6 and 8 indicating a moderate fit. The current model fit indices indicate the initial secondary model has a moderate level of model fit.

It is necessary to identify correlations among the components in the model in the modification indices section. Following the modification indices, the strong correlations among the model A1 components have been identified – e19 and e20 (MI=61.527), e28 and e26 (MI=21.751), and e16 and e31 (MI=31.646).

FIGURE 27: MODEL A1: MARKET RESOURCES (IMPROVED SECONDARY FACTOR MODEL)



Model A1 secondary model has been improved by following the suggestions within modification indices mentioned above (Figure 27), and the results of the CFA Maximum Likelihood estimation demonstrate that: CMIN = 587.302 (CMIN/DF=2.634), p<.001, NFI =.932, CFI=.956, RMSEA =.063, 95%CI (.057, .070), PCLOSE<.001, SRMR=.054

According to the criteria of identifying the quality of model fit, (1) CMIN is significant (p<.001), showing the exact fit (H0) will be rejected; (2) RMSEA is significant (p<.001) which demonstrates the close fit (H0) can be rejected; (3) 95% confident intervals of RMSEA is ranging between .057 and .070, which has not exceeded .1 showing the poor fit will also be rejected; (4) the results of NFI is .932 and CFI is greater than .95 that have shown good quality of model fit; (5) RMSEA is .063 showing a moderate fit, and standardized RMR (SRMR) is lower than .06 demonstrating a good model fit; (6) the chi-square per degree of freedom is 2.634 is close to 2, showing the good quality of model fit. In conclusion, model A1 has a good quality of model fit.

5.6.3.5.2 Model Fit of Model A2

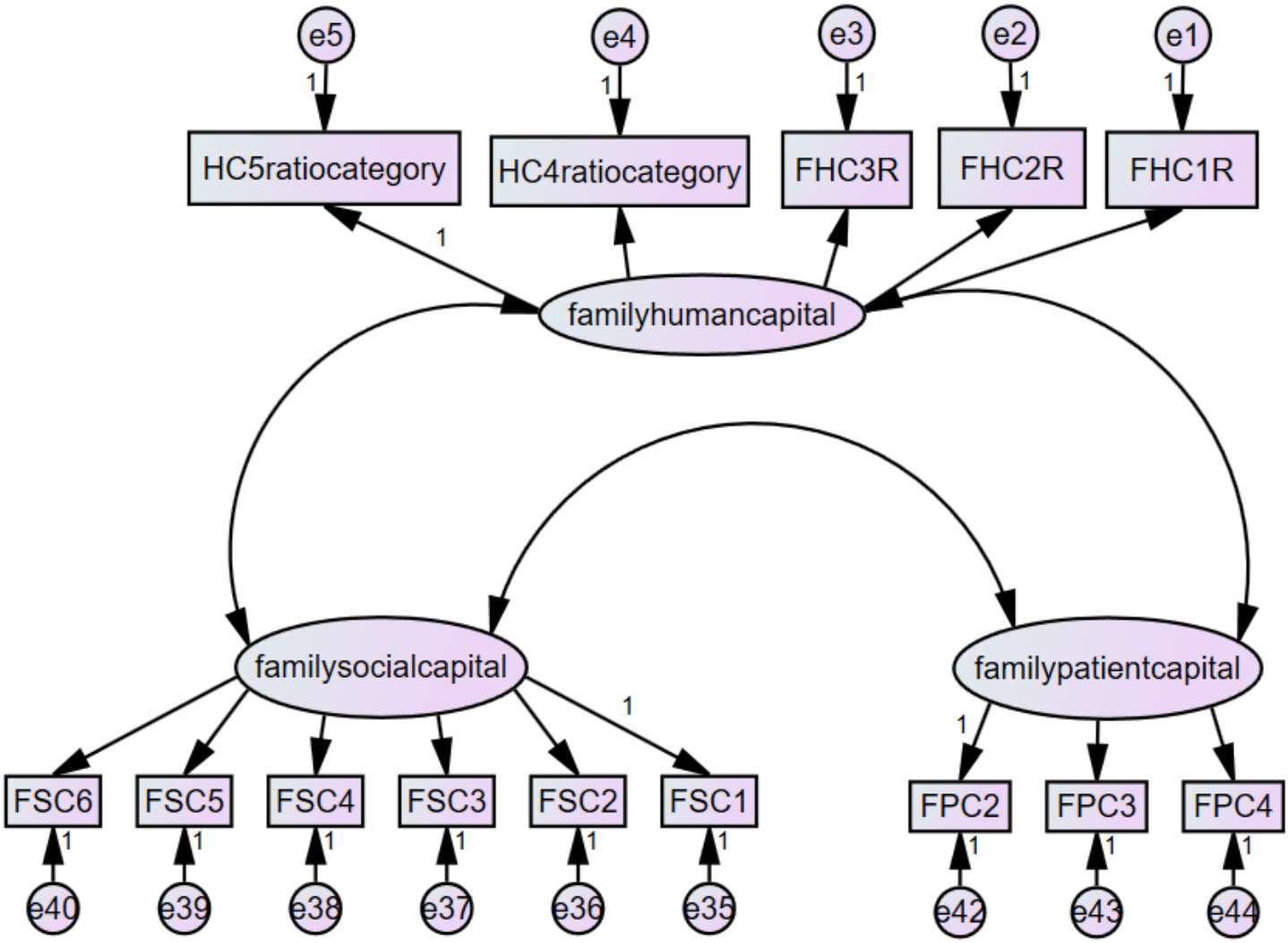
The initial model A2 was constructed by utilizing covariance paths to connect among family patient capital, family human capital and family social capital (Figure 28).

The family human construct items – FHC4R and FHC5R – family human capital construct have measured, respectively, the number of family employees is holding university degrees, and the number of family employees is holding business education. However, the responses coming from the two measures have failed to take the proportions (i.e. the number of family employees holding a university degree out of the total number of family employees who are currently in the firm; the number of family employees holding business education out of the total number of family employees who are currently in the firm) into account. Without considering the size of family employees in a firm, it could create bias within a relationship between the number of family employees holding either a university degree or business education, and family owners' willingness to pursue radical innovation.

Since FHC6R measured the total number of family employees who are currently in the firm, FHC4R and FHC5R were re-coded respectively as 6 levels (from 0 to 5) of percentage range – 0 = 0%, 1 = 1-19%, 2 = 20 -39%, 3 = 40-59%, 4 = 60-79%, 5 =≥80%. Hence, the items of FHC4R and FHC5R have become the measures regarding the percentage of family employees holding degrees.

In addition, FHC6R were deleted from the family human capital measure because FHC6R focuses mainly on the number of family employees in the current firm which does not concentrate on measuring 'human capital' (i.e. skills, knowledge and experiences held by individuals).

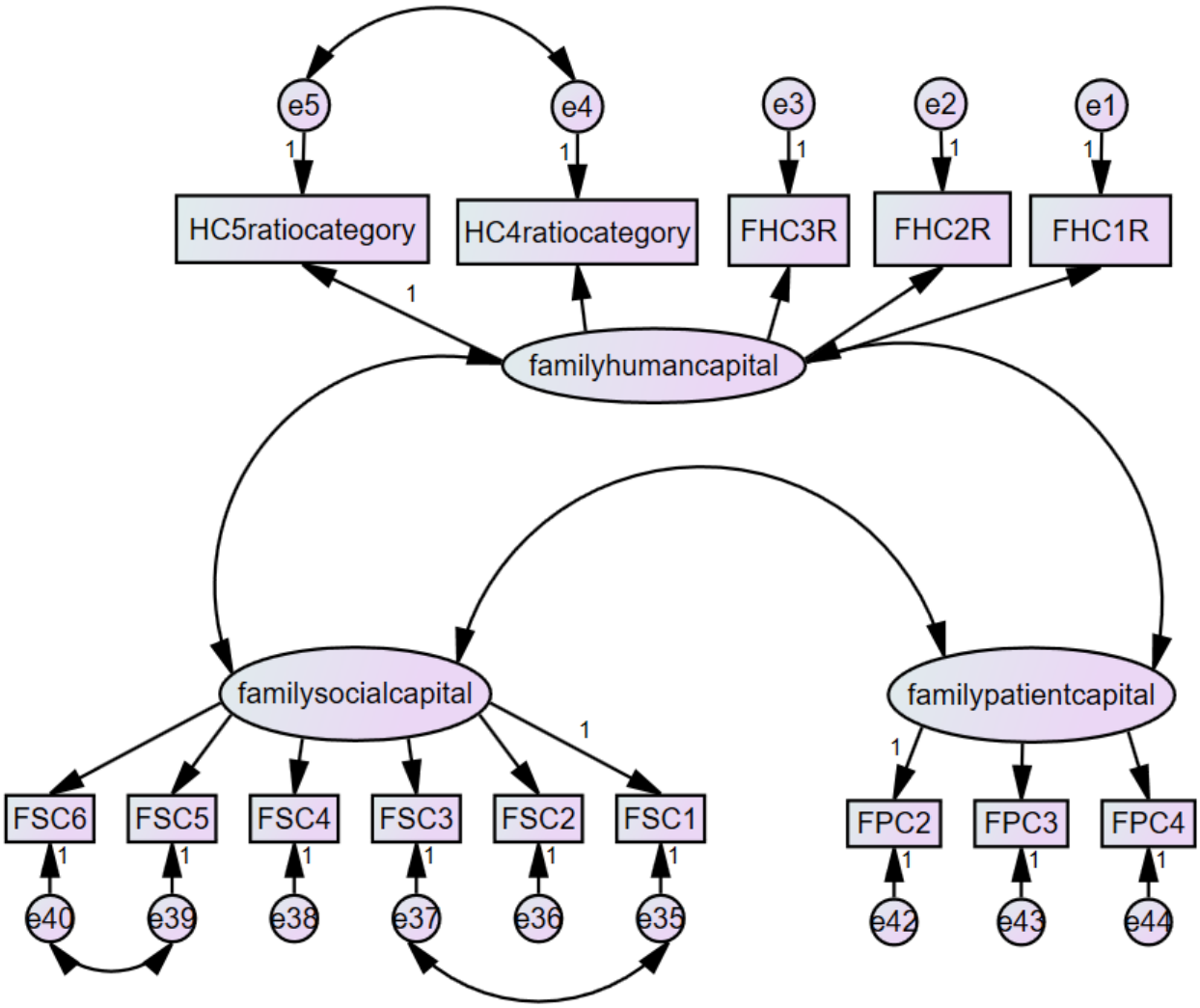
FIGURE 28: MODEL A2: FAMILY IDIOSYNCRATIC RESOURCES (INITIAL MODEL)



The results of the CFA Maximum Likelihood estimation show that: CMIN=406.921 (CMIN/DF=5.499), p<.001, NFI=.859, CFI=.881, RMSEA= .105, PCLOSE < .001, 95%CI (.095, .115), Standardized RMR = .06.

The initial results have demonstrated a poor model fit. First, CMIN is significant in showing the exact fitting model is rejected, and CMIN/DF is greater than 5 providing a poor fit. Second, both NFI and CFI are less than .9 indicating a poor model fit. In addition, RMSEA value has exceeded .1 demonstrating a poor model fit even although Standardized RMR is between 6 and 8 indicating a moderate fit. The current model fit indices indicate the model fit of the initial model is poor.

FIGURE 29: MODEL A2: FAMILY IDIOSYNCRATIC RESOURCES (IMPROVED MODEL)

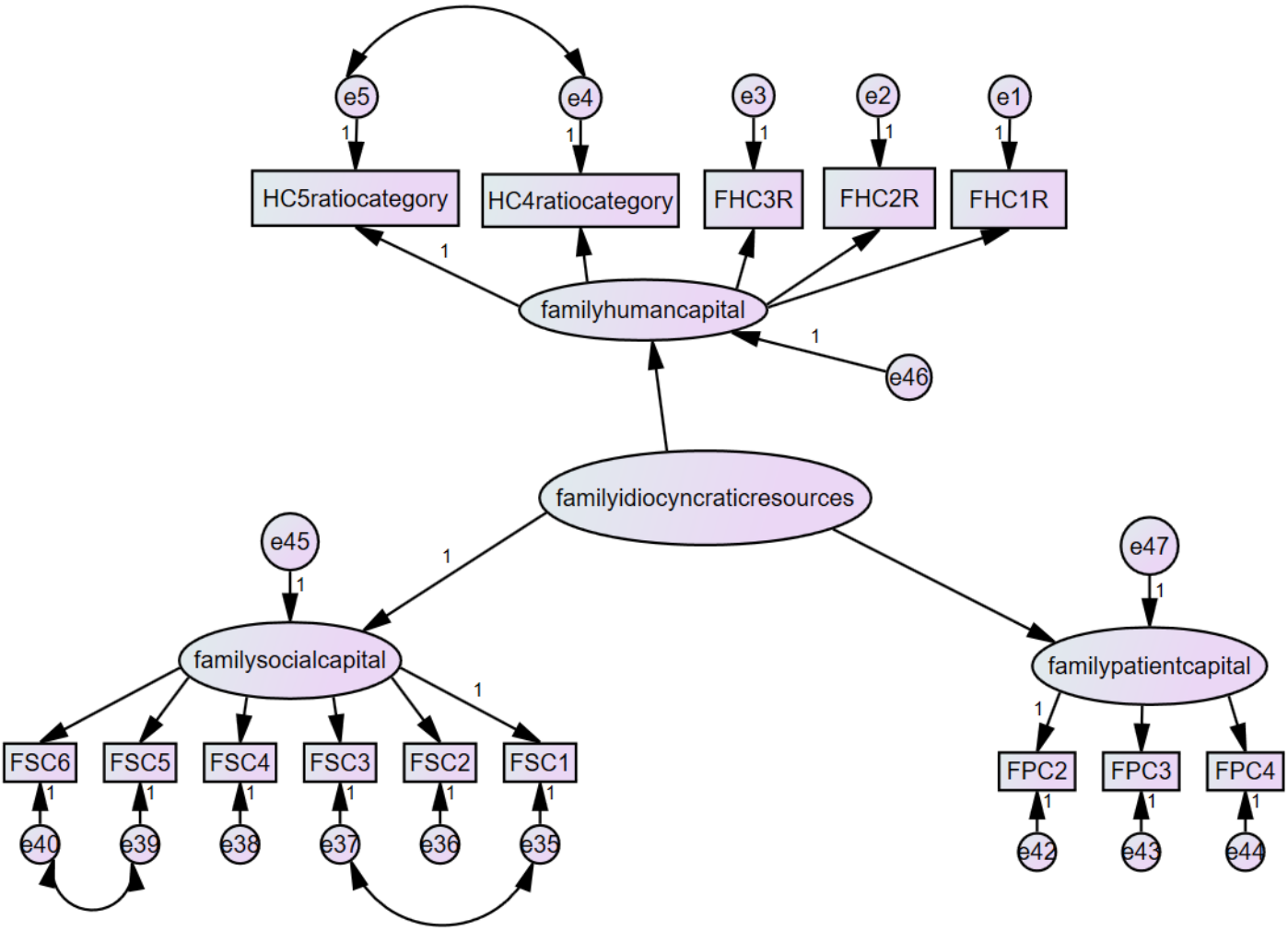


Following the modification indices, the strong correlations among the model A2 components have been identified – e39 and e40 (MI=176.068), and e35 and e37 (MI= 11.45). After the covariance paths have been added between the components mentioned above (Figure 29), the CFA Maximum Likelihood estimation then shows that: CMIN=177.517(CMIN/DF=2.500), p<.001, NFI=.939, CFI=.962, RMSEA=.061, PCLOSE=.055>05, 95% CI (.050, .072), Standardized RMR =.0459.

According to the criteria of identifying the quality of model fit, (1) CMIN is significant (p<.001), showing the exact fit (H0) will be rejected; (2) RMSEA is insignificant (p>.05) which demonstrates the close fit (H0) can be retained; (3) 95% confident intervals of RMSEA is ranging between .05 and .072, which has not exceeded .1 showing the poor fit will also be

rejected; (4) NFI is less than .939 indicating a moderate fit, but CFI is greater than .95 that have shown good quality of model fit; (5) RMSEA is .061 showing a moderate fit, and standardized RMR (SRMR) is lower than .06 demonstrating a good model fit; (6) the chi-square per degree of freedom is 2.5 which is between 2 and 3, showing the good quality of model fit. In conclusion, model A2 has a good quality of model fit.

FIGURE 30: MODEL A2: FAMILY IDIOSYNCRATIC RESOURCES (IMPROVED SECONDARY MODEL)



Since family social capital and family patient capital are family idiosyncratic resources (Morgan et al., 2006), another form of model A2 was constructed as a secondary model regarding building up a family idiosyncratic resources factor and then connecting to the latent factors – family social capital and family patient capital by using direct paths (Figure 30).

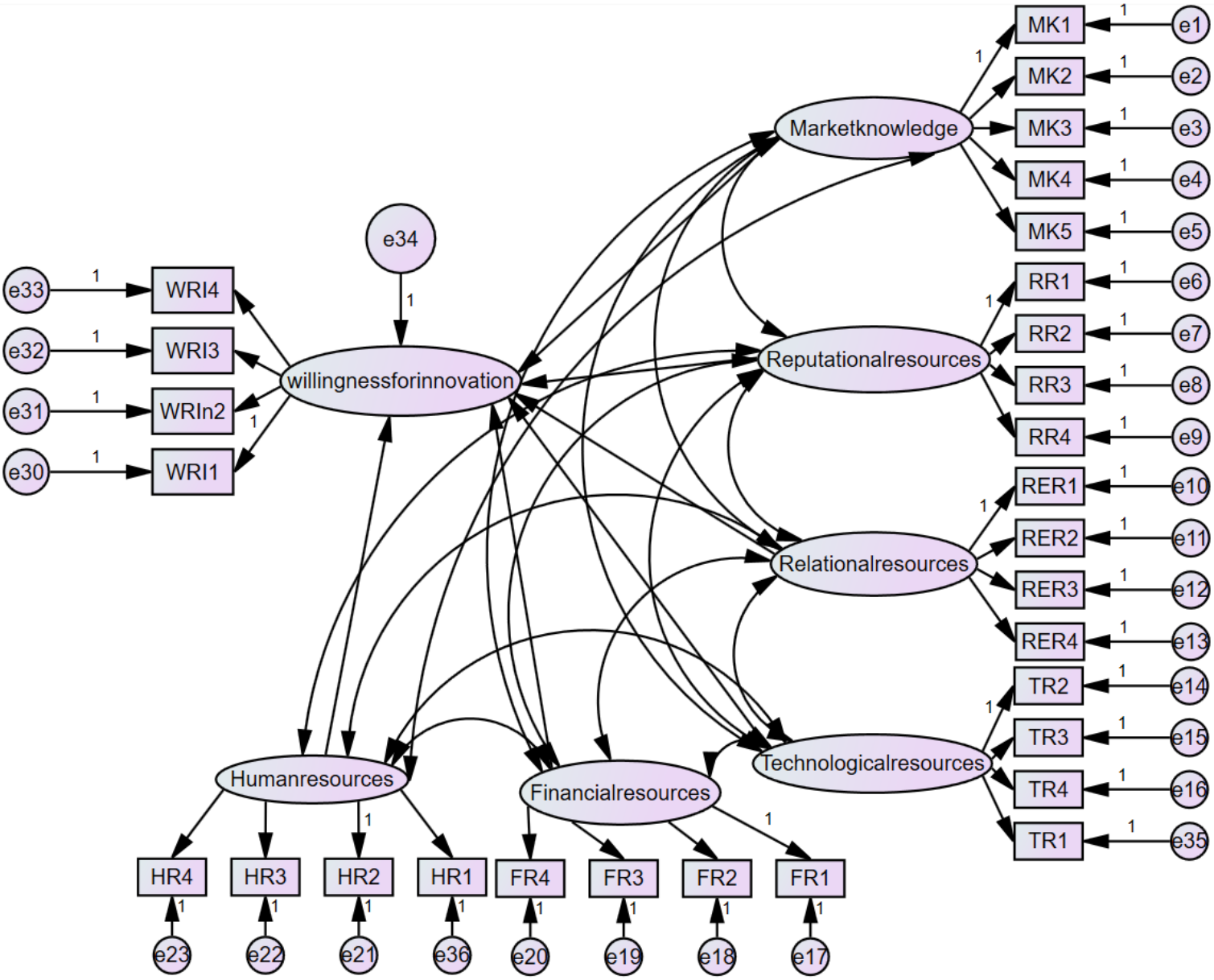
Model A2 secondary model has been improved by following the suggestions within modification indices in terms of connecting e39 and e40 (MI=176.068), and e35 and e37 (MI= 11.45) by covariance paths. The results of the CFA Maximum Likelihood estimation

demonstrate that: CMIN=177.517(CMIN/DF=2.500), p<.001, NFI=.939, CFI=.962, RMSEA=.061, PCLOSE=.055>05, 95% CI (.050, .072), Standardized RMR =.0459.

According to the criteria of identifying the quality of model fit, (1) CMIN is significant (p<.001), showing the exact fit (H0) will be rejected; (2) RMSEA is insignificant (p>.05) which demonstrates the close fit (H0) can be retained; (3) 95% confident intervals of RMSEA is ranging between .05 and .072, which has not exceeded .1 showing the poor fit will also be rejected; (4) NFI is less than .939 indicating a moderate fit, but CFI is greater than .95 that have shown good quality of model fit; (5) RMSEA is .061 showing a moderate fit, and standardized RMR (SRMR) is lower than .06 demonstrating a good model fit; (6) the chi-square per degree of freedom is 2.5 which is between 2 and 3, showing the good quality of model fit. In conclusion, the model A2 secondary model has a good quality of model fit.

5.6.3.5.3 Model Fit of Model B

FIGURE 31: MODEL B1: INDEPENDENT AND DEPENDENT VARIABLES (INITIAL MODEL)

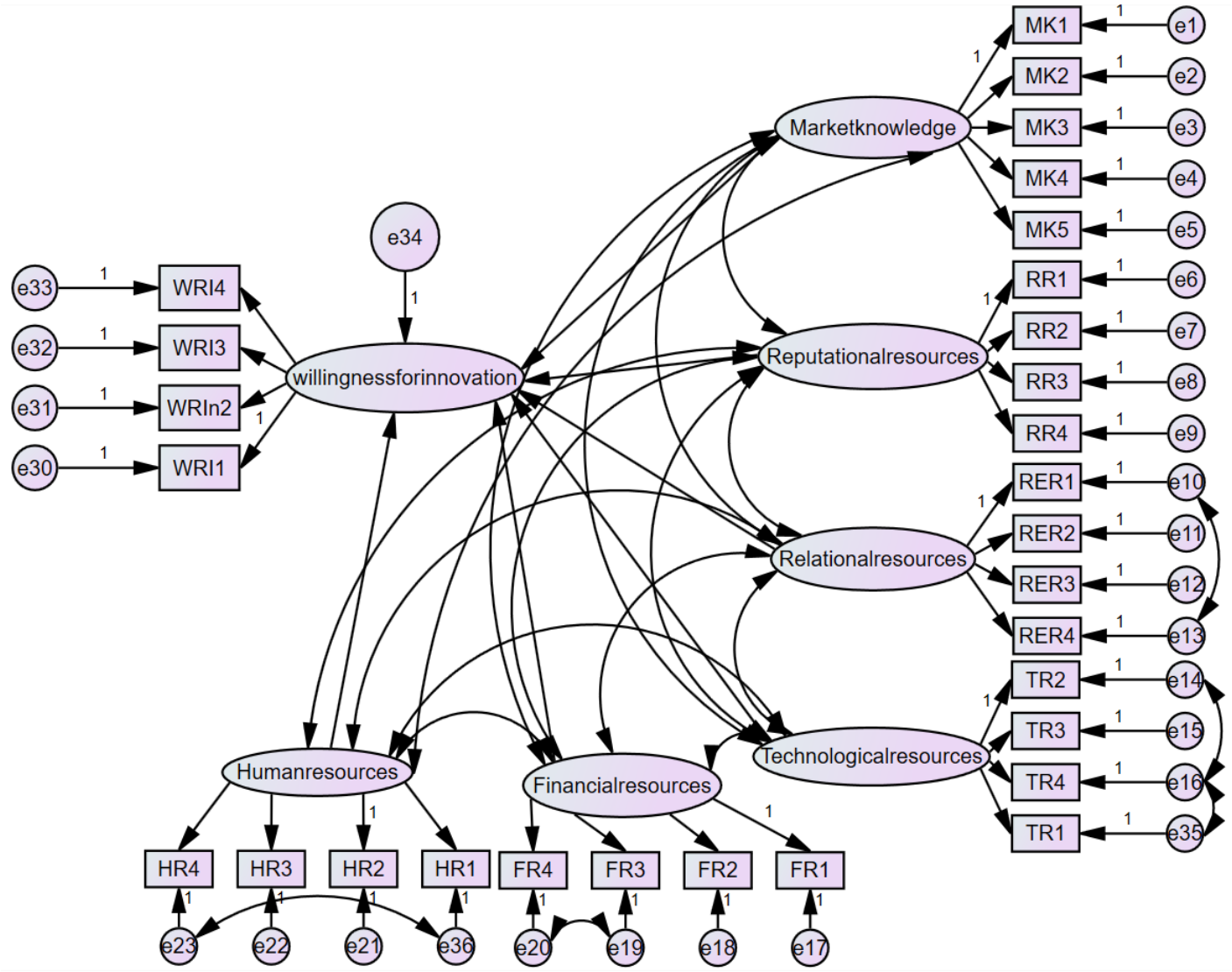


Model B1 was initially constructed by connecting the market resources and family owners' willingness to pursue radical innovation factor with direct paths. Market resources factor includes latent factors (financial resources, human resources, market knowledge, reputational resources, relational resources, and technological resources) (Figure 31). The results of the CFA Maximum Likelihood estimation demonstrate that: CMIN=967.108 (CMIN/DF=2.724), p<.001, NFI=.913, CFI=.943, RMSEA= .065, PCLOSE < .001, 95%CI (.060, .070), Standardized RMR = .0612.

Above are the initial results of the model B1, CMIN is significant showing the exact fitting model is rejected, and CMIN/DF is between 2 and 3 providing a good fit. In addition, both NFI and CFI are lower than .95 indicating a moderate level of model fit. While, both RMSEA and Standardized RMR are between 6 and 8 indicating a moderate fit. The model fit indices indicate model B1 has a moderate level of model fit.

Following the modification indices, the strong correlations among the model B1 components have been identified – e19 and e20 (MI=58.429), e16 and e35 (MI=33.539), e14 and e16 (MI=15.632), e23 and e36 (MI=13.577), and e10 and e13 (MI=12.671).

FIGURE 32: MODEL B1: INDEPENDENT AND DEPENDENT VARIABLES (IMPROVED MODEL)



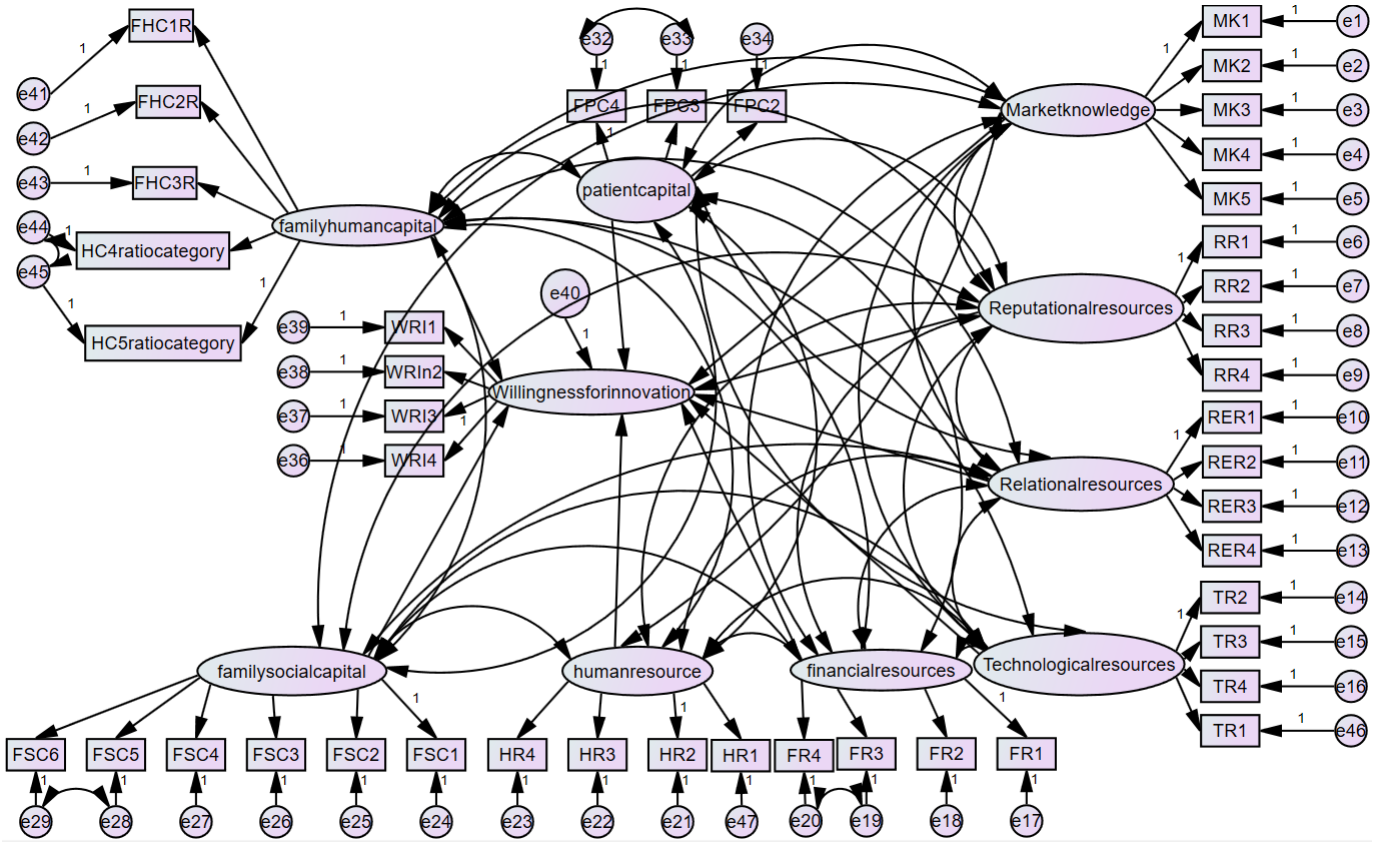
Model B1 has been improved by following the suggestions within modification indices above (Figure 32), and the results of the CFA Maximum Likelihood estimation demonstrate that: CMIN = 881.861 (CMIN/DF=2.512), p<.001, NFI =.921, CFI=.951, RMSEA =.061, 95%CI (.056, .066), PCLOSE<.001, Standardized RMR=.0567.

Based on the criteria of identifying the quality of model fit, (1) CMIN is significant (p<.001), showing the exact fit (H0) will be rejected; (2) RMSEA is significant (p <.001) which demonstrates the close fit (H0) can be rejected; (3) 95% confident intervals of RMSEA is ranging between .056 and .066, which has not exceeded .1 showing the poor fit will be rejected; (4) the results of NFI is .921 which is less than .95 demonstrating a fair model fit, and CFI is greater than .95 that have shown good quality of model fit; (5) RMSEA is greater

than .06 showing a moderate fit, and standardized RMR (SRMR) is less than .06 demonstrating a good model fit; (6) the chi-square per degree of freedom is 2.512 is close to 2, showing the good quality of model fit. In conclusion, model B1 has a good quality of model fit.

5.6.3.5.4 Model Fit of Model B2

FIGURE 33: MODEL B2: INDEPENDENT AND DEPENDENT VARIABLES (COMPLETED MODEL)



Model B2 has been constructed by connecting market resources, family idiosyncratic resources and family owners' willingness to pursue radical innovation together with both direct and covariance paths (Figure 33); and the results of the CFA Maximum Likelihood estimation demonstrate that: CMIN = 2264 (CMIN/DF=2.411), p<.001, NFI =.863, CFI=.914, RMSEA =.059, 95%CI (.056, .062), PCLOSE<.001, Standardized RMR=.0626.

Based on the criteria of identifying the quality of model fit, (1) CMIN is significant (p<.001), showing the exact fit (H0) will be rejected; (2) RMSEA is significant (p <.001) which demonstrates the close fit (H0) can be rejected; (3) 95% confident intervals of RMSEA is ranging between .056 and .062, which has not exceeded .1 showing the poor fit will be rejected; (4) the results of NFI is .863 which is less than .95 demonstrating a poor model fit, and CFI is .914 which is less than .95 that have shown moderate quality of model fit; (5)

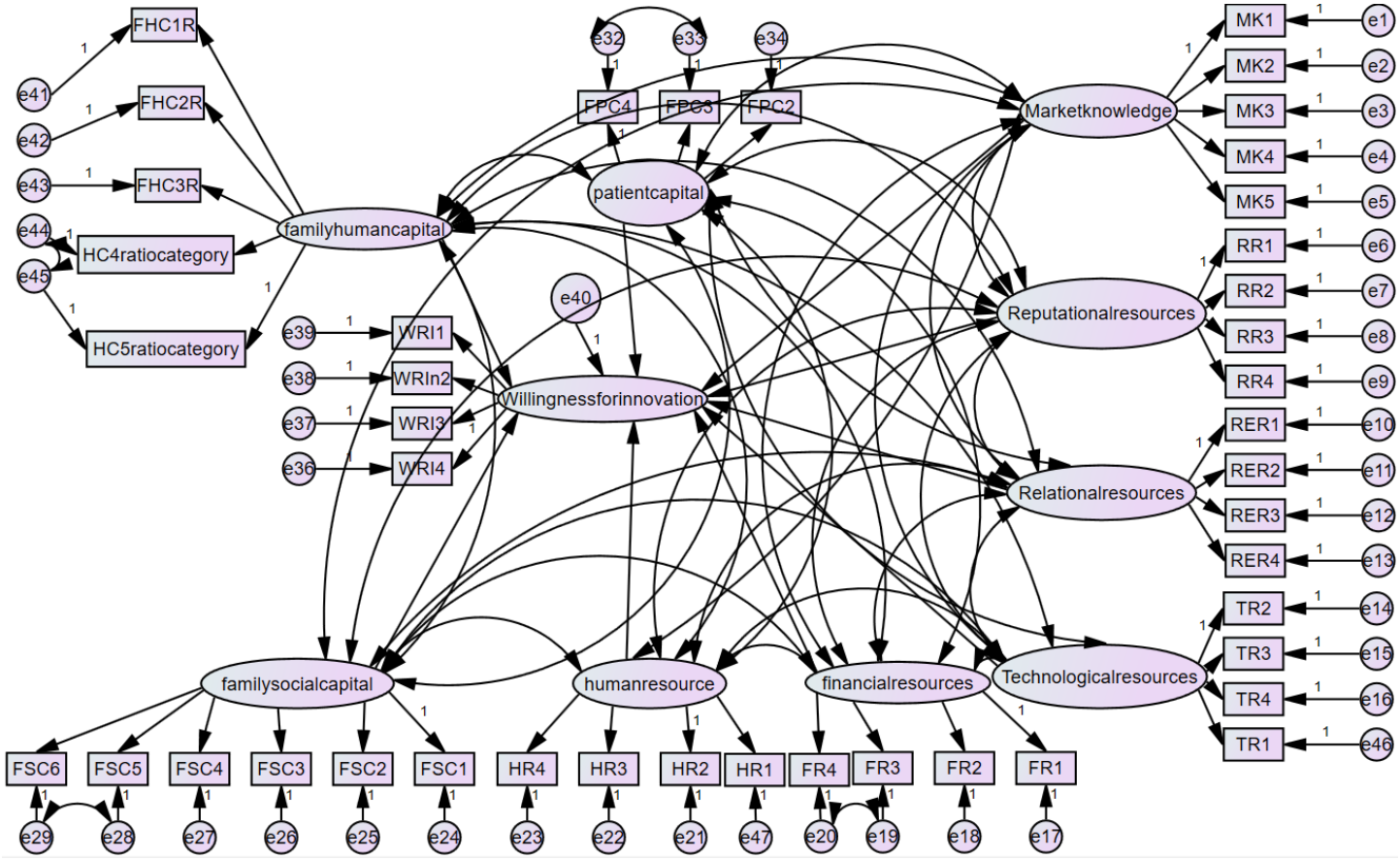
RMSEA is less than .06 showing a good fit, and standardized RMR (SRMR) is greater than .06 demonstrating a moderate model fit; (6) the chi-square per degree of freedom is 2.411 is close to 2, showing the good quality of model fit. In conclusion, model B2 has a good quality of model fit.

5.6.4 SEM RESULTS: MODEL 2

In this section, the SEM results will be presented in three different forms: (1) results from the initial model which contains family firm resources factors and family owners' willingness to pursue radical innovation factor; (2) results regarding the initial model after the control variables have been brought in.

5.6.4.1 SEM RESULTS: MODEL 2 (INITIAL MODEL)

FIGURE 34: MODEL 2 (INITIAL MODEL)



Model B was selected as the initial model to present the initial SEM results (Figure 34). The theoretical intention of the current study is to identify which family firm resources are important to family owner-managers' willingness to pursue radical innovation. Model B was constructed by connecting the nine family firm resources (exogenous variables) to the family owners' willingness to pursue radical innovation (endogenous variable), which has shown

the close linkage with the theory. In addition, the standardized estimates will be reported instead of unstandardized estimates.

TABLE 43: INITIAL SEM RESULTS OF MODEL 2

Variable	R square
Family patient capital	.18
Family social capital	.12
Family human capital	.05
willingness to pursue radical innovation	.661

Variables relations			Standardized Estimates	S.E.	C.R.	P
Family idiosyncratic resources						
Family patient capital	→	willingness to pursue radical innovation	.421***	.065	6.283	.000
Family social capital	→	willingness to pursue radical innovation	.341***	.056	5.415	.000
Family human capital	→	willingness to pursue radical innovation	-.219**	.079	-3.284	.001
Market resources						
Market knowledge	→	willingness to pursue radical innovation	.084	.108	.98	.327
Reputational resources	→	willingness to pursue radical innovation	.009	.051	.181	.856
Relational resources	→	willingness to pursue radical innovation	-.016	.111	-.208	.835
Technological resources	→	willingness to pursue radical innovation	.109	.054	1.777	.076
Financial resources	→	willingness to pursue radical innovation	.01	.038	.203	.839
Human resource	→	willingness to pursue radical innovation	.51	.077	.92	.358

Note. Significant level: ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

According to Table 43, the statistically significant relationship between family idiosyncratic resources and a family owners' willingness to pursue radical innovation is supported. (1) H1 has been supported by the current results. There is a strong positive statistically significant relationship between family patient capital and family owners' willingness to pursue radical innovation (.421, p<.001), indicating the increase of one unit of the family patient capital factor will lead to .421 unit of increase in the factor of family owners' willingness to pursue radical innovation. (2) H2 is supported by the results. There is a negative statistically significant relationship between family human capital and family owners' willingness to pursue radical innovation (-.219, p=.001<.05), demonstrating the increase of one unit in family human capital factor will lead to .219 decrease in family owners' willingness to pursue radical innovation factor. (3) H3 has been supported by the current results. There is a strong positive statistically significant relationship between family social capital and family owners' willingness to pursue radical innovation (.341, p<.001), depicting the increase of one unit in family social capital factor will lead to .341 increase in family owners' willingness to pursue radical innovation factor.

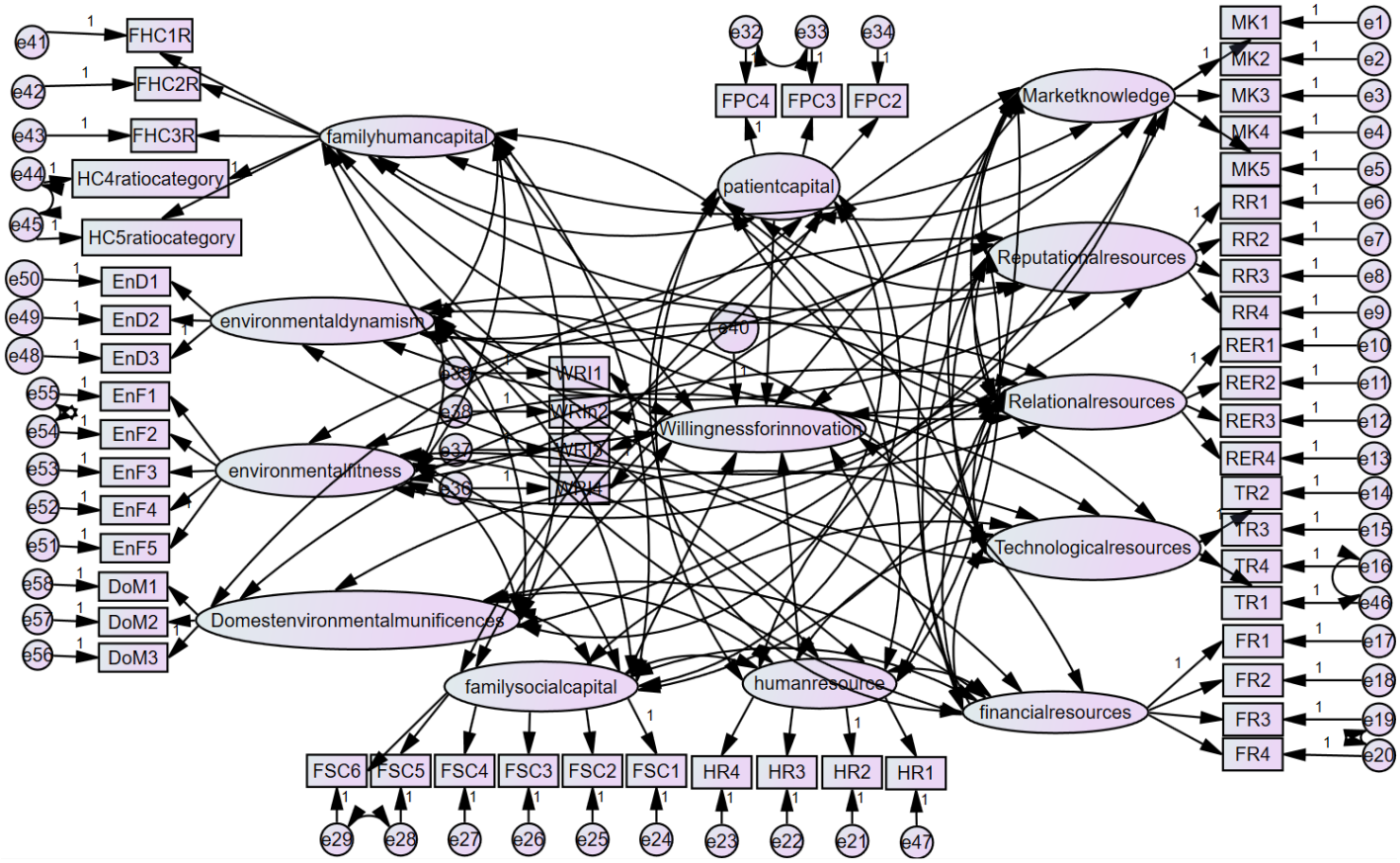
However, the statistically significant relationship between market resources and the family owners' willingness to pursue radical innovation is not supported. (1) H4 is not supported, as there is no statistically significant relationship between market knowledge and family owners' willingness to pursue radical innovation (.084, p=.327>.05). (2) H5 is not supported – there is

no statistically significant relationship between reputational resources and family owners' willingness to pursue radical innovation (.009, p=856>.05). (3) H6 is not supported – there is no statistically significant relationship between relational resources and the family owners' willingness to pursue radical innovation (-.016, p=.835>.05). (4) H7 is not supported – there is no statistically significant relationship between technological resources and the family owners' willingness to pursue radical innovation (.109, p=.076>.05). (5) H8 is not supported – there is no statistically significant relationship between financial resources and the family owners' willingness to pursue radical innovation (.01p=.839>.05). (6) H9 is not supported – there is no statistically significant relationship between human resources and family owners' willingness to pursue radical innovation (.051, p=.358>.05).

In addition, .661 squared multiple correlations (R squared) of family owners' willingness to pursue radical innovation has been explained by the family firm resources, indicating the 66.1% of the variance in family owners' willingness to pursue radical innovation are explained by family firm resources. The main contribution was derived from family idiosyncratic resources factors.

5.6.4.2 SEM RESULTS: MODEL 2 (COMPLETED MODEL)

FIGURE 35: MODEL 2 (COMPLETED MODEL)



Three control variables were brought into the initial model – environmental dynamism, environmental fitness and domestic environmental munificence (Figure 35). Within the current model, these control variables are treated as exogenous factors the same as other family firm resources factors and are allowed to covary with the family firm resources factors.

During the model construction, a strong correlation was found in the modification indices section – e16 and e46 (MI=34.306). The model was, thereafter, improved by adding covariance paths between the components mentioned above (Figure 35). The results of the CFA Maximum Likelihood demonstrate: CMIN = 2264 (CMIN/DF=2.411), p<.001, NFI =.85, CFI=.913, RMSEA =.055, 95%CI (.052, .057), PCLOSE=.001<.05, Standardized RMR=.0581.

Based on the criteria of identifying the quality of model fit, (1) CMIN is significant (p<.001), showing the exact fit (H0) will be rejected; (2) RMSEA is significant (p <.001) which demonstrates the close fit (H0) can be rejected; (3) 95% confident intervals of RMSEA is ranging between .052 and .057, which has not exceeded .1 showing the poor fit will be rejected; (4) the result of NFI is .85 which is less than .95 demonstrating a poor model fit, and CFI is .913 which is less than .95 that have shown moderate quality of model fit; (5) RMSEA is less than .06 showing a good fit, and standardized RMR (SRMR) is less than .06 demonstrating a moderate model fit; (6) the chi-square per degree of freedom is 2.411 is close to 2, showing the good quality of model fit. In conclusion, the current model has a good quality of model fit.

TABLE 44: FINAL SEM RESULTS OF MODEL 2

Variable	R Square
Family human capital	.04
Family social capital	.07
Family patient capital	.134
Environmental dynamism	.03
Willingness to pursue radical innovation	.682

Relationship variables		Standardized Estimate	S.E.	C.R.	P
Family idiosyncratic resources					
Family human capital	willingness to pursue radical innovation	-.197**	.075	-3.054	.002
Family social capital	willingness to pursue radical innovation	.261***	.059	3.929	.000
family patient capital	willingness to pursue radical innovation	.366***	.101	3.921	.000
Market Resources					
financial resources	willingness to pursue radical innovation	-.012	.042	-.234	.815
Technological resources	willingness to pursue radical innovation	.105	.055	1.689	.091
Relational resources	willingness to pursue radical innovation	-.012	.108	-.157	.875
Reputational resources	willingness to pursue radical innovation	.002	.051	.049	.961
Market knowledge	willingness to pursue radical innovation	.074	.106	.874	.382
human resources	willingness to pursue radical innovation	.056	.074	1.045	.296
Control variables					
Environmental dynamism	willingness to pursue radical innovation	.169*	.052	2.445	.015
Environmental fitness	willingness to pursue radical innovation	.034	.047	.675	.5
Domestic environmental munificence	willingness to pursue radical innovation	-.03	.043	-.656	.512

Note. Significant level: ***p≤.001, **p≤.01; *p≤.05; not significant (p>.05)

Based on the results shown in Table 44, it shows similar results to the initial model regarding family idiosyncratic resources have a statistically significant relationship with the family owners' willingness to pursue radical innovation. Meanwhile, market resources are not statistically significantly related to the family owners' willingness to pursue radical innovation. In addition, it is also important to note that there is a positive statistically significant relationship between environmental dynamism and family owners' willingness to pursue radical innovation (.169, p=.015<.05), regarding an increase in environmental dynamism factor will lead to .169 increase in family owners' willingness to pursue radical innovation. Lastly, 68.2% variance of family owners' willingness to pursue radical innovation has been explained by the overall exogenous factors. It demonstrates that resources play a significant role in influencing family owners' willingness to pursue radical innovation.

5.7 CONCLUSION

Two models were examined by following the theoretical models which were established in Chapter 3. Before the SEM testing, the current study had utilised ways to prepare the data. It began with data screening which includes effect size checking, outliers defining, multicollinearity checking, and normality discussion to ensure the data has the favourable condition. In addition, EFA was conducted to verify the construct items to ensure the items which hold the same underlying domain could be mapped under the same construct. Model 1 has kept all the items (observed variables), but unfortunately, three items (FPC1, FPC 5 and FPC 6) were removed from the model due to these cross-loaded other items within model 1. The results from the EFA, thereafter, were verified within CFA through model fit indices.

Two forms of each model have been demonstrated during the SEM – initial model and completed model in order to show the procedures of the model improvement and model trimming. The results have supported two hypotheses (H1 and H5) in model 1 and three hypotheses (H1, H2 and H3) in model 2. The contributions will be discussed in depth followed by the limitations and future research direction of the current study in Chapter 6.

CHAPTER 6

DISCUSSION

6.1 INTRODUCTION

After testing the hypotheses for two models by relying on the 412 observations from 213 family firms, this chapter will discuss the findings from model 1 and model 2 in a detailed manner within two separate sections responding to the radical product innovation. For each section, it will demonstrate to what degree the findings (in Chapter 5) are closely related to the theoretical predictions developed in Chapter 3 (Theoretical Conceptualisation Chapter), and to what degree the findings are different from the findings in previous family innovation studies. The theoretical and managerial contributions of each model will be developed. And a discussion of the future publication strategy will be presented at the end of each section. Moreover, this chapter discussed the possibilities to integrate the two models. The framework in relation to the integrated model will be developed at the end of this chapter.

6.2 DISCUSSION: THE FEAR OF LOSING SEW DIMENSIONS AND FIRM INNOVATIVENESS

6.2.1 THEORETICAL EXPECTATIONS, FINDINGS AND MEANING

The first focus of this study of family firms was to investigate the relationship between the degree of family owners' fear of the loss of five different SEW dimensions and firm innovativeness, which was developed based on the negative *emotions and problem-solving theory*. Our firm-level results show that the *fear of losing family control and influence* and *renewal of family bonds* have negative and positive impacts on innovativeness, respectively. In addition, the results demonstrate that there is no statistically significant relationship between the three other dimensions (i.e. *fear of losing family*, *fear of losing binding social ties* and *fear of losing emotional attachment*) and firm innovativeness. While the latter insignificant results were unexpected, they nevertheless help revise our expectations of the effects of SEW endowment on family firm innovativeness, revealing which features of SEW endowment are particularly important.

Negative emotion was expected to influence family owners' decision-making in different ways, in particular when grounded in family owners' concerns regarding preserving SEW. For example, family owners' decisions on investing in R&D might be driven by owners' negative emotion stimulated by the current unexpected performance of an innovation project (Chrisman & Patel, 2012). However, some family owners place less importance on the longer-term maintenance of control and influence endowment (e.g., because of alternative priorities or goals; for a debate on organizational goals, see De Massis et al. 2018), which in turn will induce a lower degree of fear emotion among such family owners. In addition, when

family owners hold a lower degree of fearful emotion on maintaining the control and influence endowment in the future, owners may exhibit a high motivation to develop the firm's innovation ability and capacity. Moreover, according to George and Zhou (2007), a negative feeling, composed of fear and anxiety, can (at least temporarily) increase individuals' tension triggering a search for alternative ways to solve the problems underpinning the tension in order to ease the negative feeling. These negative feelings manifest negative moods, and moods can contingently stimulate owners' willingness to pursue specific goals and actions (e.g., Foo, 2009).

Beginning with the fear of losing family control and influence, hypothesis 1 regarding the relationship between fear of losing family control and influence and firm innovativeness was supported. The fearful emotion generated from concerning a particular event can drive the individual to generate solutions to ease the tension of the negative feeling (Higbee, 1958). Since the family firm would adopt less innovation when the firm has high intention to preserve SEW endowment (Gomez-Mejia et al., 2007), it was expected that fear of losing family control and influence is negatively related to firm innovativeness (i.e. reducing R&D expenditure and degree of product diversification)

The finding confirms our theoretical expectation: the fear of losing family control and influence is negatively associated with firm innovativeness. At the same time, the finding also shows the consistency and contrasts with the previous family firm studies. For instance, the finding is consistent with the major arguments proposed by the previous studies that family firms have a strong intention to protect family ownership and control and avoid taking risks (Chua et al., 1999; Sirmon & Hitt, 2003; Gomez-Mejia et al., 2007; De Massis et al., 2013; Matzler et al., 2015). The results also show similarity to beliefs originating from qualitative research on FPFD type of SEW influencing family firms selecting innovation strategies in a risk-averse manner (Miller et al., 2015), and provides much-needed confirmatory evidence. The FPFD type of SEW, named 'feeding parochial family desires', entails family owners' preference to hold control of the firm and maintain its general daily operation without further expanding the firm through generations (Miller et al., 2015). FPFD leads family firms to focus on nepotism and managerial entrenchment and maintaining family perquisites and kinship harmony and to avoid taking risks (Miller et al., 2015). Therefore, if family firms have a strong intention to maintain FPFD, family firms would have a low degree of motivation to support the innovation process (including engaging new ideas, novelty and exponentiation).

The finding is still important to make contributions to enriching the knowledge of current literature. Chrisman and Patel (2012) point out family owners will increase R&D spending

when firm performance is below the aspiration of family owners. Generally, family firm performance has a close relationship with firm survival (Sciascia et al., 2015). When firm performance is below the owners' expectation, it increases family owners' tension in preserving SEW endowment and enhances the expectation of adopting innovation in an attempt to prevent non-economic wealth from a loss in the future (Chrisman & Patel, 2012; Berrone et al., 2012). Our results enrich Chrisman and Patel's (2012) finding by adding family owners' fearful emotion on certain SEW dimensions. Family owners' fearful emotion towards preserving control and influence would generate a negative impact on firm innovativeness because higher firm innovativeness is associated with a higher risk of poor performance, or at the very least higher variance in performance attached to higher degrees of firm innovativeness (i.e., due to its novelty, the uncertainty of reward and thus owners inability to predict return with sufficient certainty, etc.). In this circumstance, family owners increasingly refuse to support innovation – reducing R&D expenditure and the degree of products diversification.

In addition, the finding extends our understanding of the current literature. We conducted a quantitative study which provides new insight into how firm innovativeness would be influenced by SEW. We find that the changing of the firm's innovativeness starts from when family owners' fearful emotion is placed on the family control and influence dimension. We bring new insight into the understanding of how SEW influences firm innovation originated from Gomez-Mejia et al.'s (2007) study. Particularly, we moved the focus of the prior research to a viewpoint that firm innovativeness can be decreased when family control and influence is in the 'safe mode'. It is not the desire for SEW itself that is solely the problem as implied among existing studies, but the degree of importance and fear of loss attached to it. This varies the extent to which a family firm remains in safe mode or not, and thus alters the extent to which it sees high firm innovativeness as viable and compatible with its desire towards control and influence as a dimension of SEW. The intention of family firms to support innovation is derived from the degree of fearful emotion on preserving the family control and influence dimension. This perspective highlights that family firm innovation is more complex in its relationship with the willingness of family owners to innovate. These findings reconcile the debate on changeable family innovation behaviour at different points in time from the previous family innovation studies (Kammerlander & Ganter, 2015; Chrisman et al., 2015; De Massis et al., 2016).

With respect to Hypothesis 2, the relationship between the fear of losing family identity and firm innovativeness is rejected (H2). Generally, family identity is the overlapping image between family members' identity and firm reputation perceived by the audience (e.g. customers, both family and non-family employees, consumers and suppliers). Moreover,

family members' identity is associated with a strong shared family value (Carney, 2005). The shared value would be expected to encourage family owners to consider the benefits to most family members while making any strategic decision (Berrone et al., 2012). Also, the identity relating to a firm's image is established by continuously delivering products and services, which sets a potential relationship with innovativeness. However, family members carry the 'family name' which is highly connected to the business (Sharma & Manikutty, 2005). If family owners hold a strong fear emotion on preserving family identity, they would be expected to conduct fewer innovation activities (Berrone et al., 2010). Based on our theoretical expectation, fear of losing family identity should have had a negative relationship with firm innovativeness. But, instead, such an effect was not found.

Reasons for this unexpected outcome may be due to other underlying considerations in the relationship regarding the number of current family employees relative to the number of non-family employees, Chinese family culture and firm age (because these may alter the strength of family identity). Specifically, the context may bear an influence on the significance of family identity. Indeed, since the sample for this study was collected from manufacturing family SMEs in China, around 59.4% of family firms have less than five family members involved in the business (including the owners, and owner-managers). While such a number may be high among firms in other national or economic contexts, in relative terms, the larger size of Chinese firms and ready availability of low-cost labour suggests that family identify may be relatively low by comparison to Western expectations. In this circumstance, these family firms might have wider innovation options to fulfil the benefits of the relatively small number of family members. For example, according to the stewardship logic from Le Breton-Miller et al.'s (2011) study, the increase of family involvement can influence the change of strategic posture, and family firms with fewer relative propositions of family members could have farsighted strategic decision behaviours which could lead to the development of innovation ability. Another reason can be attributed to the Chinese family culture in which the founders involved in the business have patriarchal power over other family members to make strategic judgements (Greenhalgh, 1994). The strategic judgement follows the vision of the founder that can either benefit other family members or harm the family members' interests (Greenhalgh, 1994).

In addition, private firms witnessed a dramatic increase after 1978 when 'reform and opening up policy' was enacted (1978)[2]. However, in Chongqing (the location of this study), the first group of private manufacturers (298 firms) emerged in 2000 (National Bureau of Statistics of China, 2018). Until 2017, the majority of the SMEs manufacturers are aged less than 20

[2] It should be noted that a significant majority of family firm studies in the existing literature are based on publicly-listed family firms.

years. In the sample, 17.8% of the firms' ages are less than 8 years. The influence generated from the firm's identity might be relatively weak compared with the manufacturing SMEs from the east coast of China (National Bureau of Statistics of China, 2018). Despite family owners holding the strong fear of losing family identity, the relatively smaller number of family employees and young firm age can provide a wide range of innovation opportunities for family owners to consider, which might explain the rejection of H2.

Hypothesis 3 was removed because of the fear of losing the emotional attachment factor cross-loaded to other factors during the EFA (please Chapter 5, Section 5.5.2.1). Moving to hypothesis 4, the relationship between fear of losing bonding social ties and firm innovativeness was rejected. Bonding social ties are conceptualised as the social capital established by family firms that include ties among family members, connections with non-family employees, and external communities (Hoffman et al., 2006). Strong family social capital can provide family firms with advantages, but not always. For instance, strong internal social capital results in strong employee commitment, and strong external social capital provides family firms with data and tacit knowledge sharing. If family owners fear losing bonding social ties, family firms will support fewer innovation activities. Hence, the fear of losing family bonding social ties was expected to be negatively related to firm innovativeness.

The rejection of H4 can be attributed to several considerations. It can be argued that social ties are managed in a different way in the Chinese business context. An underlying consideration in this relationship rejection is 'Guanxi', which is derived from Confucianism and exists in every Chinese individual's life (Xin & Pearce, 1996; Park & Luo, 2001). 'Guanxi' is defined as the relationship between an individual and others who can possibly be related to the individuals, which can be assessed by the degree of trust (Yang, 1994).

The individual can rely on the wide connections within the 'Guanxi' pool to acquire or accomplish the desired results relating to business practices (Park & Luo, 2001). For instance, a firm can decrease the uncertainties of a business project after receiving assistance from combined 'Guanxi' connections in relation to politicians and entrepreneurial partnerships from the related industry (Li & Atuahene-Gima, 2001). The political influence can support the firm to secure resources, and the partners could enhance the firm's social identity by providing product collaborations with the firm (Peng & Heath, 1996). Hence, 'Guanxi' plays a significant role in accelerating market expansion and firm performance (Park & Luo, 2001).

Similar to social-exchange theory, the favours received from the 'Guanxi' pool are reciprocal and are leveraged in interpersonal exchanges (Yang. 1994; Xin & Pearce, 1996). Namely,

after individuals received benefits from the ‘Guanxi’ connections, the individuals are obligated to return the favours in order to maintain the trust and reputation (Xin & Pearce, 1996; Park & Luo, 2001). However, this is also different from the social-exchange theory; the favours do not necessarily hold an equal value between the parties but fit the gaps in which a part can seldom accomplish the tasks by itself (Park & Luo, 2001). Over time, the trust can become deep and stable as the parties within the ‘Guanxi’ network fulfil the obligations to return the favours (Sheng et al., 2011).

The strong social connections and the emerging of the new connections have been identified as critical issues which would strengthen the degree of firm inertia (Hannan & Freeman, 1977). Despite Chinese family owners having strong powers guiding firms towards their visions that allows family firms to react to the changing business environment quickly, these owners still have to consider whether the strategic decision (especially the intensive innovation) would have strong possibility to ruin the social identity perceived by the partners that will negatively impact on the maintenance of ‘Guanxi’ (Sheng et al., 2011). Although the obligations to return the favours are informal (Xin & Pearce, 1996), it is suggested that individuals should not violate the favour-return obligations to maintain the trust and reputation within the ‘Guanxi’ connections which can further impede family owners to receive the support from ‘Guanxi’ connections (Park & Luo, 2001).

Different from the theoretical argument developed in Chapter 3 regarding the fear of losing binding social ties expected to motivate family owners to develop new partnerships, instead, in Chinese business contest, fear of losing binding social ties might drive family owners to preserve the current ‘Guanxi’ connections which demonstrate deeper trust and high potential for assisting business expansion other than focusing mainly on establishing new relationships and then starting to build up the trust from scratch. In this circumstance, if family owners have a strong fear degree in that the binding social ties might be a loss, family owners might maintain the current ‘Guanxi’ relating to the existing parts instead of searching. However, family owners might, thereafter, heavily rely on ‘Guanxi’ which could negatively impact family owners’ motivation on developing the innovation ability. According to Chirico and Salvato (2014), family firms rely more and more on social capital for business needs but not strictly for innovation purposes.

It is also possible that when firms rely less on ‘Guanxi’ as the firms can achieve the desired results through the firms’ ability and capacity, these firms act more independently in strategic decisions than firms which rely heavily on ‘Guanxi’ (Park & Luo, 2001). Hence, if family firms have the ability to achieve innovation without obligations to return the favours, there is a possibility that family owners will search for new social connections when they hold the

strong fear of losing binding social ties. In this circumstance, innovativeness would be increased.

Relating to Hypothesis 5, an important finding is that fear of losing renewal of family bonds is positively related to firm innovativeness (H5). This implies that if family owners have a strong fear of losing renewal of family bonds, which entails that handing the current business down through generations will be perceived as unlikely by the owners, they will be willing to develop innovativeness.

The results demonstrate consistencies with previous studies. For example, this extends the quantitative investigation by Chrisman and Patel (2012) who suggest that transgenerational family control can shift family owners' intentions in goal pursuit more towards the long-term. Generally, family firms have an unspecified date regarding when the next generation leader will take over the firm. In the case of maintaining renewal of family bonds from being lost in the future, the present family leaders will act towards long-term wealth creation to preserve the family legacy and thereby take risks and invest in more R&D (Chrisman & Patel, 2012; Strike et al., 2015). Our results also extend the argument by De Massis et al. (2014) in which family firms can solve the ability and willingness paradox when family owners have intentions to manage transgenerational control, and the finding of Kellermanns et al. (2012) relating to generational ownership being positively related to firm support for innovation. From our study, family owners with fear of the loss of renewal of family bonds will increase firm innovativeness.

In addition, the finding further extends our understanding of the current literature. We find the changing of firm innovativeness starts from when family owners' fearful emotion is put on the renewal of family bonds dimension by adding factual evidence. We bring new insight into the understanding of how SEW influences firm innovation originating from Gomez-Mejia et al.'s (2007) study. Particularly, we move the focus of the prior research to a viewpoint that firm innovativeness can be increased when the renewal of family bonds is in the 'safe mode'. The intention of family firms to support innovation is derived from the degree of fearful emotion on preserving the renewal of the family bonds dimension. This perspective highlights that family firm innovation is following the willingness of family owners to reconcile the debate on changeable family innovation behaviour at different points in time from the previous family innovation studies (Kammerlander & Ganter, 2015; Chrisman et al., 2015; De Massis et al., 2016).

To conclude, the findings in relation to fear of losing family control and influence and fear of losing renewal of family bonds are negatively and positively associated with firm innovativeness, respectively. On the one hand, these findings have shown that the positive

relationship between fear emotion and creativity can explain when and why family owners will be motivated to make a strategic decision in developing innovation ability. On the other hand, the findings explain the innovative behaviour of family owners that is closely related to previous family firm innovation studies regarding, for example, Chrisman and Patel (2012), Berrone et al. (2012), and Strike et al. (2015). However, fear of losing family identity and fear of losing binding social ties have no relationship with firm innovativeness accordingly.

6.2.2 PUBLICATION STRATEGY FOR MODEL 1

We found family owners' fear emotion placed on maintaining particular SEW dimensions will influence firm innovativeness. Namely, family owners' fear of losing family control and influence is negatively related to firm innovativeness; Family owners' fear of losing renewal of family bonds is positively related to firm innovativeness. Existing literature treated SEW as a unidimensional construct while investigating family firm innovation behaviour (Gomez-Mejia et al., 2007; Berrone et al., 2012; Chen & Hsu, 2009). However, Unidimensional SEW causes the uncertainty in the sign of the relationship (i.e. positive or negative relationship) between family ownership and family firm innovativeness (e.g. Zahra et al., 2005; Matzler et al., 2015).

SEW covers five different aspects of nonfinancial wealth (Berrone et al., 2012). Each dimension has the potential to influence family firm innovativeness differently (Chrisman & Patel, 2012; Miller et al., 2015). However, few studies viewed the relationship between each SEW dimension and innovativeness empirically. In the present study, we investigated each SEW dimension and firm innovativeness, and generated two findings which bring significant value to family firm innovation study. In addition to viewing effects of SEW dimensions on innovativeness, we added negative emotion and problem-solving theory and demonstrated the degree of fearful emotion that family owners put on maintain particular dimensions will change the firm innovativeness, and claimed family firm innovativeness starts to change even when SEW is stable. This claim provides a viewpoint for future research that family owners' fearful emotion on maintaining SEW dimensions is worth to be concerned while investigating SEW and firm innovativeness.

Above the contributions, we aim to send model 1 on the Family Business Review which focuses on studies toward family firm governance, innovations and dynamics. Family Business Review fits the topic of model 1 regarding SEW and firm innovativeness. Moreover, our work can generate a good impact because Family Business Review is rated as ABS level 3 and the impact factor of this journal is 3.824. The publication strategy initially starts from re-screening the data following by re-examining the CFA within model 1 by using SEM

within AMOS 22 software. The present study conducted SEM for model 1 through analysing all 412 cases. However, since 199 family firms provided double responses (Response A and B), it is preferable to re-analyse the data and aggregate the responses to the firm level. In addition, observed variables (e.g. 9 observed variables are negatively skewed and flat relying on 412 cases) are different from the normal distribution within the data set. It will bring robust estimation into the CFA analysis to normalise the data and result in a better model fit (Kline, 2016). After re-analysed the data through the means mentioned above, model 1 will be ready to submit to Family Business Review.

6.3 DISCUSSION: FAMILY FIRM RESOURCES AND THE DEGREE OF FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

6.3.1 THEORETICAL EXPECTATION, FINDINGS AND MEANING

The second study investigated the relationship between the degree of family firm resources along with the family owners' willingness to pursue radical innovation, which corresponds to the urgent concerns in recent literature on the ability and willingness of family owners to innovate (e.g. De Massis et al., 2014; Chrisman et al., 2015; De Massis et al., 2018). We proposed that resources held by the family firm have attention-directing properties that can subsequently steer the family firm towards particular behaviours. Compared to their non-family counterparts, family firms normally hold specific types of resources (i.e. family patient capital, family social capital and family human capital) (Sirmon & Hitt, 2003). These resources are generated from the activities overlapping between family and a corresponding family firm (Sirmon & Hitt, 2003). For instance, patient capital is accumulated from internal financing activities among family members aiming to invest in projects with strong potential (Hoffman et al., 2006). The stock of the family human capital, in the same vein, accompanies the involvement of family members and the members' knowledge level, skills and abilities (Chirico & Salvato, 2014).

As well as family idiosyncratic resources, we added additional firm resources discussed in non-family firm innovation studies into the current study to capture a fuller suite of resource stocks likely held by any one family firm relevant to innovation activity. Specifically, innovation relies on the ability and willingness to do so. While family resources alone may provide important input to innovate, innovation as an outcome requires commercialization which relies on marketing resources (e.g., Slater et al., 2014). To date, resources beyond those idiosyncratic to the family have rarely received attention. For example, marketing resources are established while firms are interacting with the business market; these resources are related to the marketing aspects such as customer relations, firm reputation

and connections with other business parties (Morgan et al., 2003). In non-family firm innovation studies, marketing resources were found to be an important factor, but the effects may be both positive and negative (e.g., Kyriakopoulos et al., 2016). These types of resources can draw a picture of a business market for owners and managers to search and target a potential area as a breakthrough for radical innovation. Therefore. marketing resources have possibilities to influence family owners' willingness to pursue radical innovation activities.

In turn, based on the current resources and radical innovation studies, we conceptualised *family firm resources* as a combination of family idiosyncratic resources and marketing resources (i.e. market knowledge, reputational resources, relational resources, technological resources, financial resources and human resources) (the latter because of their bearing on innovation, its development and its commercialisation). The findings demonstrate that family idiosyncratic resources play a significant role in guiding family owners' willingness to pursue radical innovation (H1-3). For instance, family patient capital and family social capital are positively related to family owners' willingness to pursue radical innovation; whereas family human capital is negatively related to family owners' willingness to pursue radical innovation. However, the findings also show that there is no statistically significant relationship between each marketing resource investigated in this study and family owners' willingness to pursue radical innovation (H4-9). Although the insignificant results were unexpected, these results would later help revise our expectations of the effects of family firm resources and family owners' willingness to pursue radical innovation and demonstrate the sheer importance of family idiosyncratic resources to family firm innovation.

6.3.1.1 FAMILY IDIOSYNCRATIC RESOURCES AND FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Starting with family idiosyncratic resources and family owners' willingness to pursue radical innovation, the positive relationship between family patient capital and family owners' willingness to pursue radical innovation is supported (H1). Patient capital is defined as the financial resources accumulated from internal financial activities provided by family members aiming to receive benefits (economic or non-economic benefits) from long-term investments (Sirmon & Hitt, 2003; Hoffman et al., 2006). The advantage of family patient capital is that it can avoid having to draw on the external debt market for finance over and above family equity, which would dilute SEW in family ownership and control (Chua et al., 2017). Therefore, family patient capital has the freedom to support the pursuit of radical innovation.

The finding confirms our theoretical expectation and demonstrates the theoretical consistency and contrasts with previous studies in relation to patient capital and family owners' investment behaviour. This finding is consistent with the major family innovation idea in which patient capital is positively related to a firm's long-term investment horizon (e.g. Sirmon & Hitt, 2003; Naczk, 2016). For instance, Sirmon and Hitt's (2003) study points out that the strong family patient capital provides a high level of financial freedom for family owners to make long-term investments. In this circumstance, family owners are able to tolerate a higher level of uncertainty and target riskier economic goals. Also, patient capital aims to wait for the benefits from the long-term return that will foster family owners' investment horizon towards the long-term. A similar mechanism is found in Naczk's (2016) study. According to Naczk (2016), because patient capital focuses on pursuing long-term goals, it can shape the decision-makers' investment horizon more towards the long-term. When family patient capital is accumulating, family owners will be more and more farsighted and engage increasingly in risk-taking behaviour. Thus, family patient capital directs attention to longer-term goals as a way to increase the financial wealth of possessing such patient capital. Otherwise, merely holding such capital will at best only accrue nominal rates of interest. Larger stocks of patient capital motivate a longer-term view of return as a way of capitalizing on that asset. Our findings demonstrate that the effect is to increase the family owner's willingness to innovate.

On the other hand, our finding is also in contrast with the argument proposed by Smith and Lewis (2011) and De Massis et al. (2014). According to Smith and Lewis (2011), radical innovation might change the feature of products and ways of delivering services, which is different from the current trajectories. This innovation type has a high chance to ruin the family tradition that a family owner should be responsible for maintaining and protecting (De Massis et al., 2016). For instance, radical innovation causes firms to lose social identity, and further change the prototype in customers' minds (Sorensen & Stuart, 2000). Because of the new products and services, customers cannot connect the firm's name along with the new products and services and will then start to question the quality and lose their brand loyalty (Le Mens et al., 2015). Radical innovation, in this circumstance, decreases the firm's marketing position and endangers the firm's survival. Due to the potential impact generated from radical innovation, family owners' will barely consider adopting radical innovation.

In addition, this finding extends the knowledge in relation to how the family owners' willingness to pursue radical innovation could be enhanced, which contributes to completing the problem left in resolving the ability and willingness paradox discussed in De Massis et al.'s (2014) study. According to De Massis et al. (2014), family owners' willingness to adopt an innovation is impeded by preserving SEW. Although family involvement can increase

family owners' ability to allocate resources, the owner's willingness will be decreasing at the same time. In order to increase the firms' radical innovation possibilities, it is vital to find out in what ways the willingness of radical innovation can be increased (Veider & Matzler, 2015; Chrisman et al., 2015). Our finding indicates that patient capital can also generate a strong impact on owners' willingness to pursue radical innovation apart from SEW. For example, family owners would pursue family-centred goals when a firm holds a certain degree of financial slack. For instance, De Massis et al. (2014) find the financial slack resources will guide family owners to pursue non-economic goals rather than economic goals. Family owners have a strong intention to avoid strategic actions which have possibilities to harm SEW endowment. Although financial slack provides chances for family firms to pursue risky economic goals, radical innovation still contains a high level of uncertainties that family firms want to avoid. Therefore, patient capital might be little related to family owners' willingness to pursue radical innovation. Based on our finding, we highlight that patient capital will guide family owners' attention towards pursuing radical innovation.

Finally, the present study enriches the understanding of the existing literature. We conducted a quantitative study (412 completed surveys) and show the feasibility of the theoretical mechanisms regarding the positive relationship between patient capital and family firm investment behaviour (discussed both in Sirmon and Hitt's (2003) and Nack's (2016) studies). At the same time, we disclosure that family idiosyncratic resources are also able to generate a vital impact on family owners' willingness on radical innovation besides SEW; and adds factual evidence and new notions to the current understanding of the ability and willingness innovation paradox on how the family owners' willingness to pursue radical innovation would be increased. Our finding moves the focus of prior research to the viewpoint that family owners' willingness to adopt radical innovation can be based on the degree of patient capital held by family firms. This perspective not only highlights the importance that the family owners' willingness can be guided by family idiosyncratic resources but also creates a starting point for reconciling the debate on the relationship between family involvement and firm innovation behaviour.

Moving to Hypothesis 2, our expectation that family human capital is negatively related to family owners' willingness to pursue radical innovation is supported. Based on our theoretical expectation, family human capital is defined as the knowledge, skills and ability held by family employees. In the family firm context, family firms have apprenticeship systems to foster the next generation leaders and other family employees, such as on-the-job training for family employees at an early age (Miller et al., 2015). Apart from the knowledge and skills gained from their own family firms, family members have opportunities to acquire knowledge and skills in other companies and institutes (e.g. business school, or

social contact's company) (Miller et al., 2015). The experience, skills and knowledge gained from the apprenticeship system and outside of the firm ought to equip these family employees with the knowledge to contribute to the firm.

However, strong family human capital will lead family firms to (over)rely on the knowledge, ability and skills of the family employees in making major strategic decisions (Zahra, 2012), at a cost to the pool of knowledge held by non-family members, for example. The knowledge, skills and abilities of non-family specialists could be undermined or go unused. Family firms tend to centralize decision-making among family members, and those rely more and more on their pool of human capital. Over time, the knowledge of family members may become redundant and more specific to their history of managing the business. This in part explains why family firms frequently fail to retain non-family professionals because of the unequal treatment between the 'insiders' and 'outsiders' (Zahra, 2012). Meanwhile, the knowledge, ability and skills of the family employees are limited in the sense that they are tied primarily to the firm and the family's history. Under these conditions, family firms are said to suffer from 'strategic simplicity' in the long-run (Zahra, 2005). Without continuous knowledge absorption, it is difficult to drive family owners' willingness to pursue radical innovation (Jansen et al., 2005; Zahra, 2005). Hence, based on this theoretical expectation, family human capital is indeed negatively related to family owners' willingness to pursue radical innovation.

The finding demonstrated the accuracy of our theoretical expectation, but the finding itself shows both consistency and contrast with the existing literature. For example, the result is in line with the arguments proposed by Sirmon and Hitt (2003) regarding family human capital as a double-edged sword. On the one hand, the knowledge of the firm, ability and skills held by family employees are identified as the competitive advantage for boosting firm effectiveness in strategic implementation and productivity (Manzaneque et al., 2017); on the other hand, however, family employees' activities are influenced and shaped long-term by family context. It encourages family firms to separate 'outsiders' and 'insiders'. Also, the strong nepotistic relationships among family employees will undermine the development of non-family employees (Chua et al., 2018), which would constrain firms to utilise non-family talents' ability and knowledge and, in turn, impede family firms to pursue radical innovation (Manzaneque et al., 2017). Put simply, family human capital steers attention inwardly to the small cadre of family members as the locus of knowledge for innovation. The result is a reduction in willingness to innovate as the limitations of family human capital become apparent.

This finding also extends the current understanding by bridging the family human capital together with the family owners' willingness to pursue radical innovation. We provided an opposite viewpoint from some previous studies which argued that family human capital is an effective tool for family firm innovation because of the effectiveness and efficiency of the 'family working culture' (e.g. Chua et al., 1999; Danes et al., 2009; Miller et al., 2015). For example, Danes et al. (2009) suggested that family human capital creates an environment that would increase family owners' willingness to pursue radical innovation. Family employees with a high-level of job tenure allow them to be equipped with strong shared family values, tacit knowledge of the firm and experience of business operation (Le Breton-Miller et al., 2015). It may create an advantage in that family firms may then be positioned to react to opportunities with fast strategic implementation (Sirmon & Hitt, 2003), but whether that speed translates into effectiveness is less clear. The result of this present study shows a negative linear relationship between family human capital and family owners' willingness to pursue radical innovation, and supports the understanding that family human capital can harm radical innovation. We suggest this enriches the knowledge of the ability and willingness innovation paradox by bringing in a comprehensive measure from Ahrens et al. (2015). In previous studies, family human capital is measured by the years of family employees' work experience and the number of family employees in their firms (Dane et al., 2009). These measures neglected the knowledge which family employees could gain outside of the firm (such as business education). The current study extended the measure of family human capital and enriched the viewpoint on how family human capital influences the degree of family owners' willingness to pursue radical innovation.

With respect to Hypothesis 3, the predicted positive relationship between family social capital and family owners' willingness to pursue radical innovation is supported. In the current study, family social capital is conceptualised as an internal form of social capital, which includes the trust, reciprocity and interactions among family members within the boundaries of the family firm (Chirico & Salvato, 2014). At higher levels, this form of family social capital demonstrates a higher degree of internal knowledge flow because family members will have developed a common system of meaning in terms of language, words and behaviours which is essential for accelerating knowledge sharing (Chirico & Nordqvist, 2010) and combining knowledge (Patel & Fiet, 2011). Moreover, the family norms, mutual respect and shared values allow family members to share information, knowledge and ideas at a deep level. These idiosyncratic family features can overcome the diminishing acquisition of new knowledge rendered by reciprocity and obligation boundaries. Based on our theoretical expectation, family social capital is indeed positively associated with family owners' willingness to pursue radical innovation.

Our finding confirms our theoretical expectation and extends existing studies. For example, we support expectations proposed by Hoffman et al. (2006) and Konig et al. (2013) that strong internal communication between family employees can facilitate fast knowledge internationalization and quick flowing of information which favour family firm innovation. Also, according to Salvato et al. (2010), when family firms have favourable interactions among family employees, it can help family firms to facilitate a high level of knowledge assimilation and value transformation that will guide family firms to behave more entrepreneurially, facilitating product diversification (Rothaermel & Hess, 2007; Salvato et al., 2010). We extend this by evidencing the link to the family owners' willingness to radically innovate.

In addition, the prior research theorized the connections between family social capital and firms' innovation activities in general (Hoffman et al., 2006; Konig et al., 2013) without specifying what type of innovation is concerned. Second, De Massis et al. (2014) suggest the ability and willingness innovation paradox exists among family firms. However, they overlooked the fact that different family firms hold different resources which are important to realise the innovation plans (De Massis et al., 2014). Our study also enriches the understanding of the ability and willingness theory by providing factual evidence connecting family social capital to family owners' willingness to pursue radical innovation. Also, our study moves the focus of prior research towards a viewpoint that family owners' willingness to pursue radical innovation can be influenced by family idiosyncratic resources.

6.3.1.2 MARKETING RESOURCES AND FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

The relationship between market knowledge and family owners' willingness to pursue radical innovation is rejected (H4). In the current study, market knowledge was conceptualised as the knowledge accumulated from when a firm interacts with a business market. The knowledge covers a wide range of matters including the understanding of competitors' business activities, knowledge of customers, and past experience of delivering products and services, and the experience of dealing with business partners (Morgan, 2012). Kyriakopoulos et al. (2016) indicated that market knowledge is a stock of business history by which the firm can track and react to the next market change; however, these scholars also found that too much market knowledge resource can reduce innovation. In the context of family firms, it seems market knowledge resources are neither advantageous nor disadvantageous to innovation.

Strong market knowledge was expected to drive family firms to pursue radical innovation for three reasons. First, holding a strong knowledge of their competitors, family firms understand

how the competitors react to market change in terms of the ways of advertising and promoting products (Jaworski & Kohli, 1993). Knowledge can increase family firms' confidence in introducing new products. Second, family firms have accumulated experience in dealing with customers from the numbers of new products launched in the past. That experience was expected to be important for family firms to prepare a pursuit of radical innovation because the experience provides an overview of the target group (e.g. consumers' purchasing behaviours) which could ease uncertainties (Chrisman et al., 2015). Based on our theoretical expectation, market knowledge would have been expected to enhance family owners' willingness to pursue radical innovation.

However, the findings of the current study imply there might be other underlying considerations in the relationship between market knowledge and family owners' willingness to pursue radical innovation. One of the important considerations lies in family owners' attention to preserving family firm tradition (Chua et al., 2018). Tradition entails the knowledge of business (e.g. know-how), family culture, family value and practice which are accumulated and developed from the past which shapes the identity of family and business (De Massis et al., 2016). Generally, the tradition will be handed down to the next generation members (De Massis et al., 2018) and overrides a marketing sentiment. Hence, family tradition anchored in family owners' strategic decisions may restrict family owners' strategic options (Leonard-Barton, 1992). Although strong market knowledge can reduce market uncertainties, family owners appear to be hesitant to pursue radical innovation as radical innovation allows firms to dismiss the past and then embrace the future for a breakthrough (Adner & Snow, 2010). This is consistent with Kyriakopoulos et al.'s (2016) finding that large stocks of market knowledge resources impede innovation precisely because such knowledge is historical and poorly suited to new and emerging market circumstances.

On the other hand, after investigating six long-lasting Italian family businesses, De Massis et al. (2016) indicated that tradition is a firm resource that brings advantages to family firm innovation. So, tradition supersedes the need to rely on market knowledge stocks. First, the combination of the firm's know-how, culture and business practice can create an idiosyncratic resource bundle (Covin et al., 2016). The bundle provides the existing technical support (e.g. knowledge, manufacturing capabilities) a family firm can bring into an innovation project. Second, family firms create a solid market image for the relevant market audiences (e.g. customers, business patterners and consumers) from the first day when family firms started to deliver products and services (Berrone et al., 2012). Over the years, the knowledgeable audiences have the prototype in their minds that connects the products and services, and especially the quality of the products and services with the firm and the family name behind (Le Mens et al., 2011; Berrone et al., 2012). Relying on a strong tradition

– market image, brand awareness and reputation – family firms would receive positive responses in the market while delivering new products and services (De Massis et al., 2016). By holding a strong tradition, family firms, especially family SMEs, can save costs on accessing complementary assets (e.g. manufacturing capabilities and brand awareness) while launching new products.

However, because radical innovation results in large changes in product features, it intends to shift the images and reshape the stereotype of the products in audiences' minds (Hsu, 2006). Radical innovation generates recognition gaps between old and new products among current audiences (Hannan et al., 2012). For instance, old customers can lack the knowledge towards the utility of a new product, and the huge differences between the old and new products could confuse customers in product categorisation (Le Mens et al., 2015). Old customers might have difficulties to accept the new product and refuse to purchase (Le Mens et al., 2015), which can cause a decrease in revenue during a certain period (Sorensen & Stuart, 2000). Hence, tradition might be the reason that family owners have little willingness to pursue radical innovation, which also provides an explanation for why in our findings there is no significant association between reputational resources and family owners' willingness to pursue radical innovation (H5). Indeed, while reputational resources are beneficial when commercialising, the desire to protect reputation has also been noted as having a negative relationship with the propensity to radically innovate (Kyriakopoulos et al., 2016).

With respect to Hypothesis 6, the relationship between relational resources held by family firms and the degree of willingness to pursue radical innovation is rejected. Relational resources are a reflection of the external social capital of the family firm – ties with non-family actors – and represent the strength, duration and exchange value between firms and external social entities (e.g. supplier and channel partners). Perez-Luno et al. (2011) contended that external social connections create an environment for market information sharing, a wide range of resource access, and business cooperation, which can fill the gap of resource scarcity. Family firms can rely on these external social connections to better achieve strategic goals than they could use their own ability (Morgan, 2012). Family firms should have a wider range of support provided by business partners and have more business cooperation opportunities coming from social connections (Singh & Gaur, 2013). Hence, strong relational resources of this kind were expected to create an innovative atmosphere to motivate family owners to pursue radical innovation. Based on our theoretical expectation, relational resources were expected to be positively related to family owners' willingness to pursue radical innovation.

That no effect was apparent for relational resources with non-family entities is related to the observations for Hypothesis 3 that family social capital does have a positive bearing on family owners' willingness to innovate. This difference is important because it leads to the conclusion that the family firm relies on family social capital specifically for innovation and in doing so has less need to rely on external social capital with non-family entities for which the investment cost to build and risk of trust breaches are higher. For family social capital, such concerns could be eased (cf. Arregle et al., 2007; Zahra, 2010).

Moreover, the external social capital is potentially different from that in the Chinese business context, which might be the reason for rejecting the current hypothesis. According to Park and Luo (2001), the external social capital is identified as a firm's external 'Guanxi' connections, including the favour exchanges with the external individuals, social entities, and business partners. Compared to the external social capital in general, 'Guanxi' emphasises the obligation of favour-returning among business parties; and it is unnecessary that the favours contain the same value but to fulfil the gaps that a firm cannot achieve by their own ability (Park & Luo, 2001). Although the favour-returning is viewed as an informal and non-enforcement activity, generally, firms should commit to the activity to maintain the trust and reputation within 'Guanxi' connections to further develop wider 'Guanxi' connections (Sheng et al., 2011).

However, 'Guanxi' might play a critical role in impeding family firms to pursue radical innovation. First, favour-returning activities among business parties create a loop for firms to commit. As 'Guanxi' connections are increasing, family firms will increasingly spend time and money on maintaining business connections. Especially in family firms, 'Guanxi' connections are viewed as an important resource that they attempt to maintain through generations (Berrone et al., 2012). In this circumstance, family firms would devote more efforts to maintaining social capital than non-family counterparts (Sirmon & Hitt, 2003). When external social capital accumulates to a certain level, family firms will be crowded by a number of favours to return; it will increase the difficulties for family owners to fulfil the favour-returning obligation (Li & Atuahene-Gima, 2001). There is a possibility that family owners cannot return the favour a business party is requesting, which would decrease family owners' willingness to pursue radical innovation. Family ties, by contrast, bear fewer costs and obligations.

Moving to Hypothesis 7, the relationship between technological resources and family owners' willingness to pursue radical innovation is rejected. Technological resources entail the patent, technological and scientific resources (Kim et al., 2016). Technological resources accumulate from the past product development, innovation practice and buyout of the

patents (Kim et al., 2016). Accumulating technological resources can develop the ability to react to the dynamic environment changing quickly, and make firms better fit the tastes of customers (Kim et al., 2016). Moreover, positive experience coming from past successful innovation would allow family owners to undertake relatively larger uncertainties (Hoffman et al., 2006; Konig et al., 2013). In our theoretical expectation then, technological resources should have had a positive association with family owners' willingness to pursue radical innovation.

It might be argued that the rejection of the hypothesis can be attributed to the dataset for the current study. Although all the family firms in the dataset are SME manufacturers, these firms are present in different industrial categories. For instance, 118 firms are metal product manufacturers, occupying 27.9% of the total; the chemical and pharmaceutical family manufacturers, which is a highly innovative industrial category, occupy only 5% of the total family firms within the dataset. Therefore, the R&D intensity is likely to be unbalanced and varying among the family firms in the dataset, which might represent a reason for rejecting H7. For instance, firms with over one million RMB R&D spending occupy a small proportion of the sample (18%). The remaining others have annual R&D expenses of less than one million RMB (40% of which have even less than 200,000 RMB R&D spending). Around 5% of family firms have no R&D expenses at all in the dataset. Hence, the relationship between technological resources and family owners' willingness to pursue radical innovation might not be supported in this study because of this lack of investment.

Another possible reason for the hypothesis rejection may be the low degree of intellectual property protection in the Chinese business market. While planning innovation strategies, firms should consider brand and product imitation problems while launching new products. Trademark infringement, including counterfeiting and piracy, exists widely in Chinese manufacturing industries (Wilke & Zaichkowsky, 1999). When new products have received a high degree of positive responses from the market, it motivates competitors to either copy the products directly 100% (counterfeiting) or invent around the products making similar versions (piracy) (Wilk & Zaichkowsky, 1999).

In fact, the Chinese government provides legal protections towards intellectual property (e.g. trademark law was published in 1982, patent law was published in 1984, and copyright law was published in 1991) (Wang, 2004). However, the costs are high if a brand leader intends to deal with the cases of brand imitations (Chinanews, 2017). Normally, the brand leader might hire a team of lawyers to deal with the cases, and each case should be dealt with separately. Giving fake trainer manufacturers as an example, according to Chinanews (2017), there were 358 fake Nike trainer manufacturers who had produced 800,000,000

pairs of fake trainers in 2013. Motivated by the high profitable fake trainer market, until 2015, there were over 50,000 private fake trainer manufacturers. Apart from the fake trainer manufacturers, other trainer imitators can produce trainers with similar features to the original trainer but with different trademarks because of the 'brand confusion' (Wilk & Zaichkowsky, 1999; Cheung & Prendergast, 2006). Hence, there is little possibility that the brand leader will deal with all the fake trainer manufacturers and imitators.

In addition, small fake trainer workshops (i.e. full-time employees less than 300) could be established quickly and illegally; and these workshops can produce trainers in mass production in a short-term period (Lai & Zaichkowsky, 1999). First, the process for the legal registrations (e.g. brand, company and trademark registrations) is unnecessary prior to any production, which makes these workshops to start trainer production immediately with few obstacles or delays; second, individuals can acquire facilities and raw materials for the trainers quickly in the Chinese market. Meanwhile, these small workshops would have low costs to adopt an exit strategy (Wang, 2005; Chinanews, 2017). In conclusion, investing in technological resources is hazardous due to the relative ease with which production may be imitated as well as intellectual property violated.

These fake trainer producers can harm the benefits and brand images of the original brand leaders (Cheung & Prendergast, 2006). For instance, the products offered by the imitators can mislead buyers to believe that the products the buyers have purchased are genuine (Wilk & Zachkowsky, 1999). In this circumstance, the original brand providers failed to attract potential loyal customers. At the same time, the low quality and strange features of the products provided by both fake trainer manufacturers and imitators will ruin the image of the original brands (Lai & Zaichkowsky, 1999). In addition, the fake trainer manufacturers can offer similar products to the original ones when needed, and the prices provided by the fake trainer producers are also competitive (one-tenth of the price of the original trainers) (Chinanews, 2018). This can stimulate the purchasing behaviour of buyers (Wilk & Zachkowsky, 1999).

A similar mechanism can apply to the family firm radical innovation. Radical innovation is to introduce new products which are different from the ones offered by the current industry (Hoffman et al., 2006). If buyers have little knowledge of the new products, the buyers could be guided to believe the products offered by the fake producers are genuine. In addition to the radical innovation requiring a relatively large investment, family firms would receive the return of the investment for a long period of time. Thus, family firms will face great uncertainties. There is a possibility that a family firm can produce high-tech products that are less imitated compared to the clothes in the market (Wang, 2004), but the environment with

low intellectual property protection will still discourage firms from planning innovation strategies. Hence, in the Chinese business context, family owners might not be willing to pursue radical innovation even if they hold strong technological resources.

Furthermore, the relationship between financial resources, defined as the ability to access external financial sources, and family owners' willingness to pursue radical innovation is rejected (H8). Financial resources are conceptualised as the ability to access external cash and capital from banks and other financial entities in venture strategic actions (Morgan et al., 2006). This illustrates a distinct difference to patient capital – which reflects the family's own internal financing capacity to fund activities. Generally, radical innovation requires firms to conduct relatively large investment (e.g. investment in financial and human resources) beyond what would be needed for incremental innovation (Konig et al., 2013). In this case, it was expected that radical innovation could be constrained should family firms simply rely on relatively limited patient capital (Covin et al., 2016) (by relatively limited, it is in the sense that external debt or equity financing is much greater in quantity than financial resources held in patient capital). Therefore, it can be difficult for family firms, especially family SMEs, to balance the quality between the daily operation and the pursuit of radical innovation given relatively limited patient capital only. In this case, raising external financial resources would be expected to provide cushioning for the daily operation while firms are pursuing innovation projects (Peng, 2009). Based on our theoretical prediction, financial resources were expected to be positively related to family owners' willingness to pursue radical innovation.

The current result shows the relationship between financial resources and family owners' willingness to pursue radical innovation is rejected. The result can be interpreted through the lens of those family innovation studies that found that there is little possibility that family firms would consider external financing activities when firms are planning to pursue innovation strategies (Sirmon & Hitt, 2003; Konig et al., 2013; Chrisman et al., 2015; Covin et al., 2016). The main reason is that external financial activities will allow external financial institutions to access ownership and control (Carney, 2005). This, in turn, reduces SEW. Accordingly, as family firms are unwilling to share ownership and control, family firms will depend less on external financial entities. External financial resources, however plentiful, direct attention to the loss of control and freedom to deploy financial resources as the family sees fit. Given the significance of Hypothesis 1 regarding the benefits of patient capital towards the willingness to innovate, this rationale provides a basis to understand why external financial resources bear no reliance on the willingness to innovate – because the contribution to the willingness to innovate is offset by an unwillingness to cede control.

Finally, with respect to Hypothesis 9, the relationship between human resources conceptualised as the knowledge, experience and skills of non-family employees (Cavusgi & Zou, 1994), and family owners' willingness to pursue radical innovation was rejected. Such knowledge and experience have been associated with a positive impact on profitability, business survival, and continuity, and the involvement of non-family employees has been perceived as important for family firm innovation (Vallejo, 2009). For example, first, compared to family employees, non-family professionals can view family firms in an objective way and generate critical information which could be overlooked by family firms (Anderson & Reeb, 2004). Second, non-family employees can bring fresh ideas and insights from the external business environment. These ideas and insights may help diversify family owners' thinking during strategic decision-making (Anderson & Reeb, 2004) and steer family owners' attention towards pursuing business novelty (Barnett & Kellermanns, 2006). Based on our theoretical expectation, there was expected to be a positive relationship between human resources and family owners' willingness to pursue radical innovation.

The rejection of the hypothesis can be attributed to the separation of family and non-family employees in family firms. Although the knowledge, experience and skills of non-family employees can add value (e.g. enhancing information diversification and increasing the knowledge stock of the firms) in the pursuit of radical innovation, non-family employees are regularly excluded from key decisions (Barnett & Kellermanns, 2006) and lack decision rights compared to family members (Carney, 2005). In addition, compared to family employees, non-family employees are given less job discretion and control latitudes to perform the job (Zahra, 2005). Non-family professionals have knowledge and skills which are essential for family firm innovation, but their voice is less heard by the family decision-makers (Anderson & Reeb, 2004), or ignored outright. The isolation of non-family employees can also drive these employees to leave the firms. Especially in those family SMEs where family involvement is high, non-family employees' knowledge and skills are less likely to be integrated into key strategic decisions (Barnett & Kellermanns, 2006). Family firms struggle to radically innovate when holding limited knowledge and experience (Hoffman et al., 2006; Konig et al., 2013) (this observation is consistent with the results for Hypothesis 2 that reported a negative effect from family human capital on the family owners' willingness to radically innovate). Hence, human resources have no significant relationship with family owners' willingness to pursue radical innovation.

6.3.2 PUBLICATION STRATEGY FOR MODEL 2

We found family idiosyncratic resources – family social, human and patient capitals – will influence family owners' willingness to pursue radical innovation. Family social capital and patient capital are positively related to family owners' willingness to pursue radical innovation, and family human capital is negatively related to family owners' willingness to pursue radical innovation. In fact, family idiosyncratic resources are largely overlooked among the existing family firm radical innovation studies although the importance of family idiosyncratic resources on family firm innovation was found in 2003 (Sirmon & Hitt, 2003). Many scholars who investigated family firm radical innovation contended the family owners' willingness to pursue radical innovation is mainly guided by SEW endowment (De Massis et al., 2014; De Massis et al., 2016; Chrisman et al., 2016). Although family involvement in ownership and management provide more power for family owners to allocate resources towards radical innovation, family owners will preserve SEW more and be less willing to pursue radical innovation. Additionally, evidence shows that over 50% of radical innovations in European countries were contributed by family firms (Rondi et al., 2018). It is essential to identify alternative factors which can influence family owners' willingness to pursue radical innovation.

The present study investigated the relationship between resources and family owners' willingness to pursue radical innovation relying on attention-based view. The strong effects of family idiosyncratic resources on family owners' willingness to pursue radical innovation changed the viewpoints regarding family owners' willingness to pursue radical innovation is guided by SEW. This study provides a starting point for future research that family firm idiosyncratic resources are worth to be concerned while investigating family owners' willingness to pursue radical innovation.

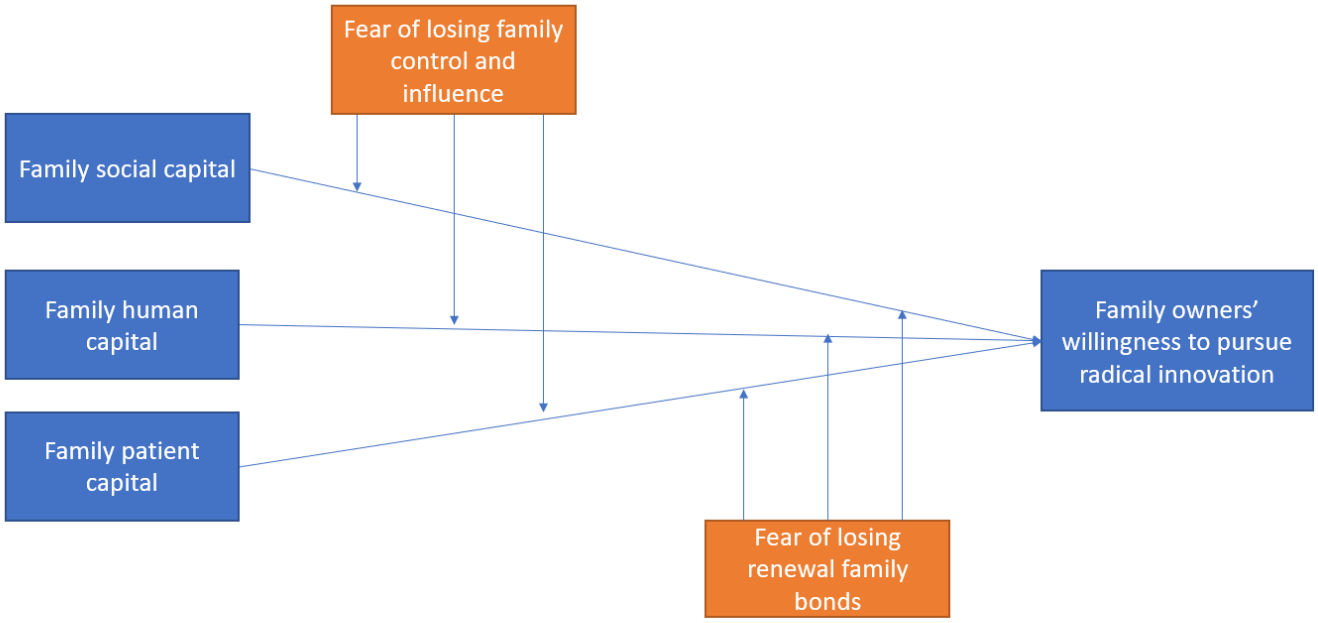
Above the contributions, we aim to send model 2 to the Journal of Product Innovation Management which focuses on managerial know of innovation management product development within SMEs. Journal of Product Innovation Management fits the topic of model 2 regarding SEW and firm innovativeness. Moreover, our work can generate a good impact because the Journal of Product Innovation Management is rated as ABS level 4 journal and the impact factor of this journal is 4.305. Likely model 1, the publication strategy initially starts from re-screening the data following by re-examining the CFA within model 2 by using SEM within AMOS 22 software. The present study conducted SEM for model 2 through analysing all 412 cases. However, since 199 family firms provided double responses (Response A and B), it is necessary to aggregate the responses. After re-analysed the data

through the means mentioned above, the model 2 will be ready to submit to the Journal of Product Innovation Management.

6.4 POSSIBILITIES OF INTEGRATING MODEL 1 AND MODEL 2 SUPPORTED BY WILLINGNESS AND ABILITY THEORY

In fact, the two models that were tested separately in the current thesis have the potential to connect with each other. Supported by willingness and ability theory, according to De Massis et al. (2014), the increase in the number of family owners leads family owners' ability to allocate resources to pursue innovation activities. However, family owners' willingness to pursue innovation activities is gradually impeded by family owners' intention to preserve SEW endowment. Although family owners' willingness to pursue innovation activities is guided by the owner's intentions to preserve SEW endowment (Gomez-Mejia et al., 2007), resources still play a fundamental role in supporting innovation activities (Morgan et al., 2006; Kyriakopoulos et al., 2016). In the present study, we found that family owners' willingness to pursue radical innovation is mainly influenced by family idiosyncratic resources (i.e. family human capital, family social capital and family patient capital). An integrated model, therefore, could be established by selecting family idiosyncratic resources as the independent variables and family owners' willingness to pursue radical innovation as the dependent variable. This relationship is expected to be moderated by family owners' fear of losing emotion placed on ownership and control, and renewal of family bonds (Figure 36). Future studies could more comprehensively test such an integrated model.

FIGURE 36 INTEGRATED MODEL



In Figure 36, based on our findings, family social capital and patient capital are positively related to family owners' willingness to pursue radical innovation; family human capital is negatively related to family owners' willingness to pursue radical innovation. However, these three relationships are moderated by family owners' fear of losing family control and influence, and fear of losing renewal family bonds based on willingness and ability logic.

First, we found family owners' fear of losing control and influence is negatively related to firm innovativeness. When family owners' fear of losing family control and influence is high, family owners' attention is steered to protecting the endowment of control and influence. In this circumstance, family owners are less willing to allocate resources towards radical innovation. Thus, high family patient capital and family social capital will result in a high degree of family owners' willingness to pursue radical innovation, and this effect can be negatively influenced by family owner's intention to preserve family control and influence. In this circumstance, we expect that the high family owners' fear of losing family control and influence will reduce the positive effects between family patient capital and family owners' willingness to pursue radical innovation, and between family social capital and family owners' willingness to pursue radical innovation; will enhance the negative effects of family human capital on family owners' willingness to pursue radical innovation. Whereas low family owners' fear of losing on family control and influence will mitigate the effects of family human capital on family owners' willingness to pursue radical innovation.

Second, the findings also show that family owners' fearful emotion placed on renewal of family bonds is positively related to firm innovativeness. When family owners' fearful emotion placed on renewal of family bonds, family owners are more willing to engage with innovation activities by allocating resources. When family owners' fear of losing renewal of family bonds is high, the effects of family social capital and family patient capital on family owners' willingness to pursue radical innovation are expected to be enhanced. At the same time, the effects of family human capital on family owners' willingness to pursue radical innovation are expected to be mitigated. Whereas the family owners' fear of losing renewal of family bonds is low, the effects of family social capital and family patient capital on family owners' willingness to pursue radical innovation are expected to be mitigated.

6.5 CONCLUSION

The present study investigated innovativeness and family owner's willingness to pursue radical innovation which are the two critical issues for firms to prepare for conducting radical innovation. The findings generated from model 1 and model 2 are important to family firm radical innovation. The first and second studies provided the theoretical arguments on: (1) between fear of losing SEW endowment on different dimensions and firm innovativeness, and (2) between family firm resources and family owners' willingness to pursue radical innovation. These two studies contributing to the current research responses in SEW dimensions might have different effects on motivating family firms to develop the innovation ability (Chrisman & Patel, 2012; Chrisman et al., 2017), and also the reasons of family owners' willingness are changing towards radical innovation respectively (De Massis et al., 2014; Chua et al., 2018).

By bringing in negative emotion and problem-solving theory, the first study found that family owners' fearful emotion in preserving family control and influence is negatively related to family firm innovativeness, and the owners' fearful emotion in preserving the renewal of family bonds is positively related to firm innovativeness. These results are consistent with the arguments mentioned by Chrisman and Patel (2012) that family firms can switch their strategic goals to the long-term when family firms enter the stage of succession. During succession, family firms are more likely to plan for receiving long-term benefits (Strike et al., 2015).

The second study found that family idiosyncratic resources have significant effects on family owners' willingness to pursue radical innovation. The results demonstrate that family patient capital and social capital are positively related to the degree of family owners' willingness to pursue radical innovation, and family human capital is negatively associated with the owner's willingness to pursue radical innovation. These results contribute to the knowledge and

complete the argument that family owners' willingness towards radical innovation can also be attributed to family idiosyncratic resources. At the same time, the present study defined family idiosyncratic resources that have enriched the knowledge of marketing resources and firm innovation literature. Lastly, these two studies were conducted as empirical studies that provided support for the theoretical arguments within the existing studies (Chrisman & Patel, 2012; De Massis et al., 2014; Kammerlander & Ganter, 2015; De Massis et al., 2016; Chua et al., 2018).

Moreover, there are also possibilities to integrate model 1 and model 2 supported by the willingness and ability theory. According to De Massis et al. (2014), family owners' willingness to allocate resources on innovation is guided by family owners' intention to preserving SEW endowment. Based on our findings, family owners' fear of loss emotion placed on family control and influence, and renewal of family bonds can reduce and enhance firm innovativeness respectively. To wit, preserving family SEW endowment can generate two different impacts on family owners' intention towards radical innovation. Therefore, family owners' fear of loss emotion placed on family control and influence and renewal of family bonds are expected to moderate the effects between family idiosyncratic resources and family owner's willingness to pursue radical innovation. This integrated model brings opportunities to our future publication.

CHAPTER 7

CONTRIBUTIONS AND CONCLUSIONS, IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

7.1 INTRODUCTION

This chapter will discuss and review the contributions, conclusions, implications and limitations of this thesis and propose essential avenues for future research. It will begin with the theoretical contributions and managerial implications of model 1 and those of model 2 in Section 7.2 and Section 7.3, respectively. The limitations and future research section will follow in Section 7.4. Conclusions will close the chapter and the thesis.

7.2 CONTRIBUTIONS AND IMPLICATIONS OF THE FIRST STUDY

7.2.1 THEORETICAL CONTRIBUTION TO SEW DIMENSIONS AND FIRM INNOVATIVENESS

The first study contained in this thesis contributes to the existing family firm innovation literature research by investigating the relationship between family owners' fear of loss emotion in particular dimensions of SEW and firm innovativeness. To date, SEW is treated as a unidimensional construct and has a negative impact on family firm innovation according to several existing studies (Gomez-Mejia et al., 2007; Berrone et al., 2010; De Massis et al., 2016; Duran et al., 2016; Chua et al., 2018). For example, Gomez-Mejia et al. (2007) point out that SEW is the non-economic wealth of family firms, which entails family members' control of the firm, maintenance family identity, developing internal and external social capital, strengthening emotional connections among family employees, and the ability to hand family properties down to the next generation leaders. In normal circumstances, family firms intend to preserve SEW, and they would avoid innovation which has certain capacities to harm SEW (Berrone et al., 2012). For example, innovation entails novelty that contains risks and uncertainties that have possibilities to render different levels of organisational changes and narrow down the family owner-managers' latitudes for control (Berrone et al., 2012; Chrisman et al., 2015). In this case, family firms would likely exhibit low intention to build up innovation ability and capacity, and in turn, witness a decrease in the firm innovativeness.

However, despite this SEW-derived logic, family firms can make a substantial contribution to innovation according to competing for evidence (Rondi et al., 2018). Rondi et al. (2018) report that over 50% of family firms made the majority of the contributions to innovation in European countries in 2015. These firms then appear to hold relatively strong ability and capacity to innovate than other private firms (OECD, 2016). Evidently, this viewpoint and information competes with the SEW-derived logic that family firms will gravitate away from the riskiness of innovation so as not to jeopardise stocks of SEW. Moreover, family firms are noticed to be relatively effective in innovation implementation compared to non-family firms.

For example, Konig et al. (2013) found that family firms have high speed and stamina for implementing innovation strategies (even intensive ones) once they have made decisions to do so. It seems from this debate that the key is the question to innovate in the first place. Based on inconsistent family firm innovation activities reported by previous studies, the study aim was to reconcile the relationship between SEW preservation and family firm innovation activities, and the purpose is to find the critical issues concerning what factors trigger or forestall innovation decisions.

To achieve our research aim and purpose, we observed the effects generated from each of the five SEW dimensions, treated multidimensionally and not as a singular whole, on family firm innovativeness by employing negative emotion and problem-solving theory. Relying on 412 completed surveys collected from the manufacturing industry in Chongqing, China, we found that family firm innovativeness is dependent on the degree of family owners' fearful emotion placed on two particular SEW dimensions: family control and influence, and renewal of family bonds. Specifically, when family owners hold a strong degree of fearful emotion that family control and influence will not be properly maintained in the future, family owners will support few innovation activities and in turn, this will result in low firm innovativeness. On the other hand, when family owners have a strong degree of fearful emotion that renewal of family bonds would not be properly maintained in the future, firm innovativeness will be influenced in positive ways.

Our findings demonstrate consistencies with previous studies. According to the existing studies, family firms will increase R&D expenditure when firm performance or innovation performance is below the aspiration of family owners (Chrisman & Patel, 2012; Berrone et al., 2012). When firm performance is below family owners' expectation, it could increase family owners' tension in preserving and protecting SEW and in turn enhance family owners' intention to focus more on innovation in an attempt to prevent non-economic wealth from a loss in the future (Chrisman & Patel, 2012). In addition, Chrisman and Patel (2012) contend that transgenerational family control can move family owners' investment horizon towards the long-term. Family owners intend to take risks in an attempt to create long-term wealth in order to preserve family legacy (Strike et al., 2015).

Our findings also extend the argument in Chrisman and Patel's (2012) and Strike et al.'s (2015) studies by adding family owners' fearful emotion in particular SEW dimensions. When family owners hold fearful emotion into preserving SEW dimensions, it could induce family owners' actions towards problem-solving. Since the stronger the individual's desire to protect things from loss, the higher the degree of fear of loss that will be generated during the period of protection (Roger, 1975). As fear gradually increases, it will motivate family owners to

escape the unpleasant feeling by taking innovation actions (Rogers, 1975). The two key findings create a new insight regarding the support of family firm innovation activities that could be changed while SEW is safe and stable. This perspective extends the knowledge on the relationship between SEW and family firm innovation activities and changes the previous viewpoint on previous SEW-derived logic (discussed by Gomez-Mejia et al. (2007), and Berrone et al. (2010)) in which family firms could avoid adopting innovation activities which contain risks of harming SEW endowment when SEW is safe and stable.

Following this discussion, in the present study, we make three contributions. First, the study enriches the existing knowledge on SEW and family firm innovation and finds that the different level of firm innovativeness is associated with the degree of family owners' fearful emotion placed on particular SEW dimensions. This study highlights that family owners can make strategic decisions to *reduce* or *enhance* innovation ability and capacity when the owners have a strong fear of loss emotion on *family control and influence* or *renewal of family bonds*. The findings move the focus of the previous studies and provide new insight on how specific SEW dimensions can impact on firm innovativeness when SEW is in 'preservation mode'. SEW is not solely a problem to impede firm innovativeness as implied among existing studies. The reason for family firms generating different levels of innovativeness is dependent on the importance attached to particular SEW dimensions by family owners.

Second, our results sought to resolve the inconsistent findings on family involvement and firm innovation activities (e.g. Zahra, 2005; Chen & Hsu, 2009; Singh & Gaur, 2013; Sciascia et al., 2015), and reconcile family involvement and firm innovation activities. The existing literature states that family involvement could increase the degree of family owners' concerns on preserving SEW and in turn support fewer innovation activities (e.g. Berrone et al., 2010; De Massis et al., 2012). However, the positive relationship between family involvement and firm innovation activities could not be explained if SEW is treated as a single body. In the present study, we extended the SEW-derived logic by showing firm innovativeness could be guided towards two directions: (1) when family owners hold fearful emotion on preserving family control and influence, family owners will refuse to support innovation activities; (2) when family owners are fearful to lose the renewal of family bonds endowment, these owners would be willing to support their family firms to innovate by increasing R&D expenditure and the degree of product diversification. Therefore, family involvement and firm innovation can have both positive and negative relationships when family owners concerned on particular SEW dimensions.

Third, our study provides empirical evidence to support the relationship between the fear of losing SEW dimensions and firm innovativeness in the Chinese business context. The findings enrich Chrisman and Patel's (2012) study by adding family owners' fearful emotion on a certain SEW dimension. Family owners' fearful emotion on preserving control and influence would generate a negative impact on firm innovativeness because higher firm innovativeness can lead to a higher risk of poor firm performance. In this case, family owners will refuse to support innovation activities, reducing R&D expenditure and the degree of products diversification. At the same time, we extend Miller et al.'s (2015) study regarding family firm innovativeness being guided by how much concern and degree of fearful emotion is placed on certain SEW dimensions by family owners.

7.2.2 MANAGERIAL IMPLICATIONS FOR FAMILY FIRMS TO INCREASE INNOVATIVENESS

Firm innovativeness is crucial for family firm survival (Sciascia et al., 2015), therefore the paradox where some family firms innovate but others do not can have sizeable implications for the longevity of family firms. Firm innovativeness continuously improves the products and services that differentiate firms from their competitors (Sharma & Lacey, 2004; Rubera & Kirca, 2012). Also, developing firm innovativeness allows firms to keep pace with changing customer preferences. In a dynamic market environment, customers' tastes are changing over time, sometimes rapidly and dramatically, but the reactions by firms are gradually slower (Hannan & Freeman, 1977). One of the reasons that can be attributed to firms have created a stable organisation and established solid relationships with business partners and with customers (Sorensen & Stuart, 2000). Sometimes, environmental changes are small that firms can barely sense and then react (Hodges & Gill, 2015). Over a period of time, once firms realise the business environment is changing and attempt to adapt to the customers' tastes, they will meet the difficulties of implementing quick strategic reactions because of the decision-making context in which decisions towards innovativeness take place. Generally, firms' strategic reactions will go through a formalised process, such as receiving confirmations from employees at different organisational layers (Hannan & Freeman, 1984). Meanwhile, firms might receive negative comments from business partners because the strategic implementation might generate a negative impact on benefits acquired by partners (Le Mens et al., 2015). Although family owners have the power to jump over a bureaucratic strategic implementation process, the owners still have to maintain the social connections with business partners and other social institutes of concern (Konig et al., 2013; Chua et al., 1999), and this can slow down the strategic reaction. While family firms are

expanding, firms will become slower to react to environmental changes (Hannan & Freeman, 1978).

Maintaining firm innovativeness is a way to establish such an ability to sense and seize business opportunities. While firms are increasingly involved in innovation activities, the knowledge and experience to innovate are also enhanced (Srinivasan et al., 2009). Firms are more and more sensitive to market change and then react to the change in relation to line improvement, and products and service refinement. Thus, firms can achieve the purpose of adapting to the changes in customers' taste and at the same time target new customer segments (Srinivasan et al., 2009). In turn, firms can maintain market power and financial position (Rubera & Kirca, 2012). Additionally, increasing firm innovativeness can also reduce the costs of future innovation activities because the stock of the knowledge, experience and patents allow firms to utilise resources in an effective way (Morgan et al., 2009). In this case, firm innovativeness can also help achieve financial effectiveness. According to Rubera and Kirca (2012), firm innovativeness has a positive impact on firms' market and financial positions.

The first study provides three managerial implication for family owners, family practitioners and owner-managers to increase firm innovativeness. First, it is important that family practitioners can guide family owners to recognise the impacts and benefits generated by firm innovativeness instead of solely searching for receiving sales performance and profits. Previous studies indicate that family owners are unwilling to support innovation in order to maintain the family control and legacy (e.g. Berrone et al., 2010; Kammerlander & Ganter, 2015; De Massis et al., 2016). In family owners' impression, innovation activities are improper in firms' strategic orientation. However, innovation activities are vital for family firms which have huge gaps in environmental fitness. These family firms with large environmental fitness gaps have problems to maintain the relationships with current customers and business partners and would fail to attract new customers (Le Mens et al., 2015). For those which have a strong intention of preserving family tradition and maintaining the status quo, obsolescence could be a critical problem for firm survival (Hannan & Freeman, 1983). Family practitioners can change the family owners' impression on innovation by finding business cases which explain business success after increasing firm innovativeness. Through such training, family owners would gradually notice that increasing firm innovativeness is necessary.

Second, our findings demonstrate that fear of losing family control and influence is negatively related to firm innovativeness, and fear of losing renewal of family bonds is positively associated with firm innovativeness. The results provide a practical way for family

practitioners to shape firm innovation. For example, family practitioners can guide family owners and owner-managers' attention more towards managing transgenerational control, such as setting the training system for fostering next generation leaders (Miller et al., 2015). The training system can include educating the next generation of family members in universities and send them to work in business partners firms. At the same time, family firms can provide on-the-job training in the incumbent firms in order to involve the next generation members in the business at an early age. These efforts put into the next generation have the potential to increase the present family owners' concerns on maintaining transgenerational control, and these owners would be willing to set intra-family succession as an important long-term goal within the firm development strategies. After devoting much effort to maintaining transgenerational control, family owners' fearful emotion on preserving the renewal of family control would be induced and emphasised. Supported by our findings, family owners would focus more on firms' future and be willing to increase their investment horizon. Through these ways, family firms would increasingly support firm innovativeness.

Third, our study demonstrates the feasibility of the relationship between fear of losing SEW dimensions and firm innovativeness in the context of family manufacturing SMEs in Chongqing, China. Family SMEs have relatively more advantages to generate innovation activities compared to large family firms (Matzler et al., 2015). The main reason can be attributed to SMEs being tied with relative less mature 'Guanxi' with business partners and other social entities than large firms, which provide conditions for these SMEs to quickly react to the business opportunities (Park & Luo, 2001). If family practitioners can guide family owners to maintain transgenerational control, it would help family firms to increase the degree of innovativeness. At the same time, family firms that keep engaging in innovation activities can also create an innovative environment to influence the decision-making behaviour of the next generation leaders (Strike et al., 2015).

However, the boundaries between family and family firms are relatively unclear, and also the decision making and implementing systems are informal in SMEs compared to those within large family firms (Sciascia et al., 2013). Family employees have a higher chance to entrench their managerial positions and pursue their personal interests. In this circumstance, family control and influence can be easily reinforced, and in turn decrease family owners' intention in increasing firm innovativeness. To solve this problem, family practitioners can guide family owners to list the explicit responsibilities for family owners in that the owners can distribute decision-making power and regulate their range of control. It could ease the family employees' attention to entrenching their managerial positions during firm development, and then decrease family owners' intention to maintain family control and influence. For the long-term perspective, it can benefit firm innovativeness.

7.3 CONTRIBUTIONS AND IMPLICATIONS OF THE SECOND STUDY

7.3.1 THEORETICAL CONTRIBUTION TO FAMILY FIRM RESOURCES AND FAMILY OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

The second study contributes to the current research debate on resolving the ability and willingness paradox of radical innovation among family firms (De Massis et al., 2014; Chrisman et al., 2016; Chua et al., 2018). Within the previous studies relating to the ability and willingness innovation paradox, the main argument is that although family involvement may increase family owners' power to allocate resources to innovation projects, family owners' willingness for radical innovation exhibits a decreasing trend while family involvement is taking place (De Massis et al., 2014; De Massis et al., 2016). This research stream suggests that family members keep involvement in ownership, governance and management in ways that guide the firms' strategic directions towards SEW preservation (Gomez-Mejia et al., 2007) instead of innovation. Therefore, family owners attempt to avoid strategies which contain risks of harming SEW endowment and in turn adopt less radical innovation (De Massis et al., 2014).

Previous studies document that family owners' willingness to innovate is mainly driven by the degree of attention that family owners put on preserving SEW (e.g. Berrone et al., 2010; De Massis et al., 2014; Chrisman et al., 2015). These studies neglect key factors which are important to guide family owners' willingness to pursue radical innovation – namely, family firm resources. Family firm resources contain family idiosyncratic resources and marketing resources. Family idiosyncratic resources were identified in 2003, and the type of resources was identified as an important factor to generate competitive advantages – increasing productivity, and organisational effectiveness and efficiency (Sirmon & Hitt, 2003). Chrisman and Patel (2012) argue that family idiosyncratic resources are essential to guide family owners' intention to pursue innovation strategies. However, there are few family firm innovation studies discussing the relationship between family idiosyncratic resources and firms' innovation behaviour with quantitative empirical evidence.

In addition, marketing resources (e.g. market knowledge) are reported among studies of traditional firms to draw owners and managers' attention to pursuing radical innovation in non-family firm innovation studies (e.g. Morgan et al., 2003; Kyriakopoulos et al., 2016). For instance, the combination of the understanding of market competitors, firm reputation and relationships with channel partners guides firms' strategic decisions on radical innovation (Kyriakopoulos et al., 2016). As a part of a firm's total resource base, marketing resources

show connections with the owners and managers' willingness in the pursuit of radical innovation (Kyriakopoulos et al., 2016). However, the existing literature conducted few investigations in relation to the relationship between marketing resources and family firm radical innovation.

Firm resources are one of the fundamental conditions for family owners to consider before planning to set a strategic goal (Covin et al., 2016). This is mainly because radical innovation requires firms to invest in financial, human and technological resources over time (He & Wong, 2004). Resource scarcity could set a barrier to slow down the process for firms to pursue radical innovation goals which contain large potential but great uncertainties (i.e., radical innovation). However, if family firms hold slack resources, family owners have better tolerance to take risks and bear uncertainties, and further have a stronger willingness to pursue radical innovation. Holding slack firm resources, therefore, firms have possibilities to encourage family owners to target radical innovation.

In the present study, we make two major contributions by relying on empirical data collected from the manufacturing industry in Chongqing, China. First, the study enriches the existing knowledge in relation to the ability and willingness paradox and illuminates that the firm resources are also vital to influence family owners' willingness to make radical innovation decisions. Before the present study, much existing literature argued that SEW endowment is the main tool to generate a major impact on the family owners' willingness in the pursuit of radical innovation (Kammerlander & Ganter, 2015; De Massis et al., 2014; Kotlar et al., 2015; De Massis et al., 2016). The present study takes a step back to concentrate on firm resources investigation and offers an alternative view: that family firms can focus on accumulating family idiosyncratic resources to improve the family owners' willingness to pursue innovation.

Second, the current study sought to bring completeness to existing arguments on increasing family owners' willingness to pursue radical innovation by providing quantitative empirical evidence from the point of view of the family firm's resources. The existing studies contend that not all family firms would enter the ability and willingness innovation paradox during firm growth (Chrisman et al., 2017). Empirical evidence shows that family firms are either innovative or conservative over time (Kammerlander & Ganter, 2015; Matzler et al., 2015; Sciascia et al., 2015; Rondi et al., 2018). Generally, strategic orientation is more flexible and malleable in family firms than that within non-family firms because family owners have full control and discretion over the firm (Chua et al., 1999; De Massis et al., 2012). Family owners guide firms' strategic directions by following the owners' personal interests (De Massis et al., 2012; Kammerlander & Ganter, 2015). The key is to find out under what

conditions family owners are willing to pursue radical innovation (Chua et al., 2018), in that respect.

In the present study, we found that the family owners' willingness to pursue radical innovation is only related to family idiosyncratic resources. Marketing resources, in our study, have little connection with family owners' willingness to pursue radical innovation although marketing resources are found to be as important to steer owners and managers' attention to pursue radical innovation in non-family firm innovation studies (e.g. Kyriakopoulos et al., 2016). We demonstrate that family idiosyncratic resources are more important than marketing resources to generate impacts on family owners' willingness to pursue radical innovation, and show that family firms and non-family firms are different. The results extend the major argument in previous family firm innovation studies (e.g. Sirmon & Hitt, 2003; De Massis et al., 2012) that not only do family and non-family firms have different innovation behaviours, but also, the two types of firms hold different firm resource structures which generate different impact on family firm radical innovation. This study also extends the knowledge to the literature on marketing resources and firms' attention to the pursuit of radical innovation (Morgan et al., 2006; Kyriakopoulos et al., 2016). Family idiosyncratic resources are yet to be identified among the previous family SMEs and innovation studies. The results demonstrate the new insights that marketing resources are less likely to influence family owners' willingness in the pursuit of radical innovation compared to family idiosyncratic resources in family manufacturing SMEs. It could be a reference point to conduct a comparison study between family firms and non-family firms regarding the marketing resources and firms' willingness to pursue radical innovation in manufacturing firms in future study.

7.3.2 MANAGERIAL IMPLICATIONS FOR FAMILY FIRMS TO ENHANCE OWNERS' WILLINGNESS TO PURSUE RADICAL INNOVATION

Radical innovation is important to boost firms' economic performance and market power (Chandy & Tellis, 2000). Radical innovation is identified as a specific innovation type, searching for novelty and new trajectories and in turn creating new ones and destroying the old ones (Srinivasan et al., 2002). Radical innovation can bring leading-edge firms more international attention and popularity which creates opportunities for international expansion. As for SMEs, the new products generated from radical innovation makes firms stand out in the current industry (Tellis et al., 2009). These SMEs may then benefit from less direct market competition, at the same time signalling to business partners with the potential market value (Swamidass & Newell., 2017). The firms would realise the growth of profit and

business collaboration. According to Tellis et al. (2009), firms could temporarily monopolise the current business market.

Radical innovation requires firms with a certain level of ability in maintaining a radical innovation process and commercial implications (Slater et al., 2014). In order to adopt radical innovation, Tellis et al. (2009) suggest that: (1) firms should continuously build up their ability and capacity to innovate – accumulating resources, producing patents and investing in training; and (2) prepare to accept the changes brought by radical innovation. These two basic conditions for adopting radical innovation are a challenge for family firms. First, a family firm has a family centralised decision-making process in relation to family employees holding power in major decisions other than taking suggestions from non-family professionals into account (Miller et al., 2015). The knowledge coming from non-family talent is largely overwhelmed. Besides, family firms are less likely to involve non-family professionals in board and management to avoid losing family ownership and control (Zahra, 2005). In this circumstance, family firms normally have a slow process to accumulate scientific skills. Additionally, family firms have a strong intention to preserve and protect family tradition and are unwilling to accept dramatic changes which will ruin the tradition (De Massis et al., 2016). Therefore, it is a challenge for family practitioners to guide family owners and other family members to pursue radical innovation.

Our study provides three solutions for family owners, family practitioners and owner-managers to enhance family owners' willingness to pursue radical innovation. First, family practitioners should make family owners and lead other family members to understand the significance of adopting radical innovation by providing training, appointing external innovation specialists and consultants to give lectures at different points in time. Meanwhile, family practitioners can provide examples (e.g. business cases) for family owners and other family members to follow in order to foster their farsighted investment horizon. When family owners and other family members hold a certain level of knowledge towards radical innovation, it is relatively easy for family practitioners to encourage internal financial activities and then accumulate patient capital.

Second, our study suggests that family social capital is positively related to family owners' willingness to pursue radical innovation. Family practitioners can suggest family firms focus more on enhancing the level of trust, reciprocity and interactions among family members and employees. According to Kramer and Tyler (1996), trust is fast established among people if they share a similar background, values and beliefs. Family firms have advantages to maintain the level of trust among family members and employees because they share the same family background and family values.

However, radical innovation leads to organisational changes which have the possibility to generate conflicts among family members. To deal with the potential conflicts, family practitioners can recommend family owners to hold family meetings and social activities more frequently to increase interactions between family members and employees. These social activities can create an informal communication environment in which employees are willing to share ideas more (Kraut et al., 2002). With more information and ideas sharing, the degree of reciprocal activities could be enhanced among family members and employees. Besides, family practitioners can guide family owners to list the explicit responsibilities for family owners so the owners could distribute decision-making power and regulate their range of control. It could ease the family employees' attention on entrenching their managerial positions and in turn prevent increasing family conflicts during the radical innovation process. These efforts can increase family firm social capital and in turn enhance the family owners' willingness to pursue radical innovation.

Third, our results suggest that family human capital is negatively related to family owners' willingness to pursue radical innovation. It gives a hint that providing heavy training for family employees or sending family employees to receive business education are not necessary if family firms are willing to pursue radical innovation. However, training the next generation of leaders is necessary. (This implication may contrast with one of the managerial implications in the first study regarding family firms creating a system to foster the next generation of family members. The purpose of creating a young generation fostering system is to attract family owners' attention on a renewal of family bonds and in turn steer family owners' investment horizons towards the long-term).

In this circumstance, family practitioners can suggest family owners create a more focused training system for fostering young generation members in order to maintain family human capital under a certain level. It is suggested that family firms can provide equal training opportunities for both family and non-family employees and involve certain non-family talent in the major decision-making process. This perspective can establish the sense that family firms provide equal chances for both family and non-family employees and ease the attention on abilities coming from 'insiders'.

7.4 STUDY LIMITATIONS AND FUTURE RESEARCH

As with all studies, the current work is not without limitations. The first limitation is that our sample is mainly private firms in manufacturing industries in Chongqing, China. Chongqing contains 4242 private manufactures (including over 80% family firms) and demonstrates significant R&D spending consisting of 23-billion-yuan (around 2.6 billion GBP) by firms which have 20 million yuan revenue annually (National Bureau of Statistics of China, 2017).

Moreover, the number of private manufacturing firms and R&D ratio is around 5.4 million yuan spending per each firm in Chongqing. It also demonstrated a 10% annual growth of the number of new private manufacturing SMEs between 2012 and 2015 (Chongqing Annual Report, 2015). Therefore, Chongqing has provided a context for a robust investigation of family firms innovation.

However, collecting data in one city (Chongqing) generates restrictions on the generalizability of the findings to any populations of family firms in contexts significantly different from those of this study. Specifically, Chinese family firms are shaped by Chinese family culture – family founders have absolute powers over others in decision-making, and firms exhibit a collective working culture (Greenhalgh, 1994) – which has the potential to influence the effects of fear of losing particular SEW dimensions and firm innovativeness and effects of family firm resources and family owners' willingness to pursue radical innovation. Therefore, the significant relationships found in both of our studies would benefit from addition replication or testing across different geographic areas in China and other countries. Moreover, both of our studies relied on a cross-sectional research design. The future research could examine our models between the fear of losing SEW dimensions and firm innovativeness, and the relationship between family firm resources (family idiosyncratic resources and marketing resources) and family owners' willingness to pursue radical innovation across different countries with divergent cultures by employing longitudinal research design.

The second limitation is that both models were analysed in the SMEs context, which shows our findings and resources might not be generalisable to larger-sized family firms and also a large family firm. The future research can bring large family firms into this discussion, which might demonstrate different insights for the two research models in the present study because large firms hold more mature resource stocks, or can adopt a comparison study between Chinese family firms and family firms in western countries. Third, firm innovativeness is a broad term which can relate to different innovation types (e.g. radical innovation and incremental innovation). Additionally, the present study did not classify family firm innovativeness into high, moderate, and low types. Scholars can categories the degrees of firm innovativeness while applying our models in future studies. It should be noted that the family firm literature has seldom considered types of innovation outcomes and whether the circumstances for their creation differ.

Fourth, the present study conceptualised and theorised family firm resources as the combination of family idiosyncratic resources and marketing resources. However, firm resources cover different types of resources (Barney, 1991). Additionally, resources bundles

(combination of different resources) could generate different effects to encourage family firms to innovate (Covin et al., 2016). Future research may cover a wider range of firm resources and at the same time involve the analysis of resources bundles towards family firm's innovation. The more important resources which steer family owners' intention to pursue radical innovation might be found.

Fifth, the constructs of fear of losing SEW dimensions could be better defined. The SEW construct was originally defined by Berrone et al. (2012). Although SEW covers five dimensions, SEW is still treated as a unidimensional construct within many previous studies (e.g. Chrisman et al., 2012; Kraiczy et al., 2014; Sciascia et al., 2015; Kammerlander & Ganter, 2015). Considering the acceptance of internal consistency, the items measuring the five dimensions can share similar meanings. In the present study, the construct items for fear of losing SEW dimensions were established based on the measures of the original SEW dimensions. Although EFA extracted four factors, the items of measuring fear of losing emotional attachment are cross-loaded with the items of the other four dimensions. Future research could better develop the constructs for fear of losing SEW dimensions.

7.5 CONCLUSIONS

In previous family firm innovation studies, SEW has been treated as a unidimensional construct which was expected to be negatively related to family firm innovation (e.g. Gomez-Mejia et al., 2007; Berrone et al., 2012), but results have been mixed, suggesting a more nuanced examination of SEW is warranted (Chua et al., 2018). The first study created the new insights that firm innovativeness could be impacted when family owners draw their attention to particular SEW dimensions. Specifically, the present study identifies that firm innovativeness is guided by the family owner's fearful emotion on family control and influence, and on renewal of family firms. We demonstrate that firm innovativeness can be influenced when SEW is in 'safe mode'. In addition, this study reveals which SEW dimensions *do not* bear influence on family firm innovativeness and whose fear of loss does not alter whether family owners choose whether to invest in family firm innovativeness. Our study provides a new viewpoint for family firm innovation scholars to investigate the relationship between SEW and family firm innovation activities by employing negative emotion and problem-solving theory in future studies.

In addition, we provide new insight into specifying the mechanism along which radical innovation occurs in the family firm, which is important but less discussed in the family firm innovation sphere (Konig et al., 2013; De Massis et al., 2016). In previous family firm innovation studies, scholars argued that family firms generally adopt less innovation and behave in a risk-averse manner (e.g. Gomez-Mejia et al., 2007; De Massis et al., 2012).

However, radical innovation is important to create better environmental fitness, contribute to firm survival and maintain a better market position (Konig et al., 2013). The present study identifies the resources that family firms can develop and accumulate to result in a better ability to conduct radical innovation. Specifically, we conclude that family idiosyncratic resources carry overwhelming importance over more generic marketing resources potentially available in some guise to other firms. However, non-family firms cannot replicate family idiosyncratic resources. While innovation relies on commercialisation which should rely on marketing power, for family firms, the possession of those resources does not motivate family owners towards radical innovation activity.

Despite these important and timely insights, the present study is not exempt from limitations. Future research can re-examine the two models in different geographic areas, diversify the industry categories, and involve different types and sizes of family firms. Additionally, the constructs of fear of losing particular SEW dimensions could be further developed in the future. Through these efforts, new insights would be brought into the models.

APPENDICES

APPENDIX A ONLINE SURVEY PART A

Dear Participant

My name is Qilin Hu, and I am studying for a PhD degree at Durham University in the UK. For this project, I am examining innovation in the family firm. Because you have experience of managing family firms, I am inviting you to participate in this research study by completing the attached survey. Your views will make vital contributions to Family Business Studies.

The following questionnaire will require approximately 50 minutes to complete. There is no compensation for responding nor is there any known risk. In order to ensure, that all information will be treated in the strictest confidence, please do not include your name. If you choose to participate in this project, please answer all questions by following your feeling and your immediate reaction. There are no right or wrong answers. Participation is strictly voluntary, and you may refuse to participate at any time.

Thank you for taking the time to assist me in my educational endeavours. The data collected will provide useful information regarding the family firm innovation study. As the compensation for your effort, if you would like a report of the research findings, please answer YES for question 47, and fill in your Email address question 48.

Sincerely,

Qilin Hu
Durham University Business School
Durham University
Mill Hill Lane
Durham DH1 3LB
Email: Qilin.hu@durham.ac.uk

Section A: Personal Information

1. What is your gender?
□ Male

□ Female

□ Prefer not to say

2. What is your age?_____

3. How many years of work experience you have in your current firm? _____
4. How many years of work experience you have in your current industry?_____

5a. in which industry is your business?
□ Food processing and food and beverage manufacturing

□ Tobacco products industry

□ Textile industry, chemical fibre manufacturing industry

□ Clothing, shoes and hats, leather manufacturing

□ Wood processing and wood, bamboo, rattan, palm, grass products, furniture manufacturing

□ Paper and paper products, printing, culture, education and sports, office supplies manufacturing

□ Non-metallic mineral products industry (including cement, glass, ceramics, refractories, etc.)

□ ferrous metal, non-ferrous metal smelting and rolling processing industry

□ Metal products industry

□ Petroleum processing, coking processing industry

□ Chemical raw materials and chemical products manufacturing

□ Pharmaceutical manufacturing

□ Rubber products, the plastic products industry

□ General equipment and special equipment manufacturing industry

□ Transportation equipment manufacturing industry

□ Electrical machinery and equipment, cable manufacturing

□ Communications equipment, computers and other electronic equipment manufacturing

□ Instrumentation manufacturing

□ Handicrafts and other manufacturing

5b. if none of the above industries is available, please mention your industry in the blank box down below.

5c. What is the age of your current firm?
5d. How many employees are currently in your firm?_____

6. Which city is your company located?

7. What is your current position in your firm?

Family employees are defined as employees who have family relationships with each other, such as father, mother, son, brothers, sisters, cousins and so on. Non-family employees are defined as employees who do not have family relationships with current family members who dominate the company.

8. Are you one of the family members?

Yes □ No □

9. Do you have responsibility for strategic decision-making in the firm?

Yes □ No □

10. Have you decided to pass your ownership and control to the next generation?
□ Yes
□ No – Undecided
□ No – will not pass on ownership and control to next generation
□ No – seeking to exit (sell, etc.)
□ No – seeking to sell

11. Do you wish/expect the future successor as president of your business to be a family member?
□ Yes
□ No

I made this question by my own based on the idea from Chrisman and Patel (2012)

12. What is your ambition for the firm in the next 5 years?

□ maintain the status quo and sustain the current activities of the firm

□ grow your firm and focus on investment in new market

13. Which generation leader is currently controlling your firm?_____

14. How many the next generation members have work experience outside of your firm? _____

15. Have you ever sent your child/children to study abroad?

□ Yes
□ No – but I am planning to send my child/children to study abroad
□ No – I prefer they stay in China
□ No – I have no plan to send them abroad

16. How many generations are involved in management? _____

17. How many family employees have a university degree?_____

18. How many family employees have a business education?_____

19. How many family employees are currently in the firm? _____

Family human capital Ahrens et al. (2015)

20. How many full-time employees (both family and non-family employees) are employed in your firm? _____

21. How many hours of training per employee are offered by your firm per year? _____

22. How many percentages (approximate number) of non-family employees have received training out of the total number of non-family employees? _____

23. How many non-family full-time employees are employed in your firm?_____

24. How many non-family full-time employees have a university degree?_____

25. How many non-family employees have been promoted in the past three years?_____

26. How many new non-family recruitments do you have in the past three years?_____

27. How much work experiences do you require new non-family employees must have?
□ No requirement
□ One year of work experience from any industries
□ One year of work experience from relevant industries
□ Two years' work experience from any industries
□ Two years' work experience from relevant industries
□ More than two years' work experience from any industries
□ More than two years' work experience from relevant industries

Non-family human capital Saenz (2005)

28. How much is family net worth (in thousands) held by your firm?_____

29. How much is business net worth (in thousands) held by your firm?_____

Financial capital Danes et al. (2009)

30. What is the name of your firm?

Section B: A general description of product innovation

Radical product innovation is searching for market potential and niches and creating something new. The new product is the breakthrough in the current product. There are examples demonstrating below.

Radical innovation example 1: Electric-powered cars replaced the gasoline power system of traditional cars with batteries. Electric car owners can charge the electric vehicle at home.

Radical innovation example 2: Online education has changed traditional education in terms of students should go to school to fulfil the academic obligation. St udents can take lectures and seminars at home, hand in the homework online, and eventually received certificate and qualification.

31. By referring to the given two radical innovation examples above, please identify and rate the radical shift between the pairs of products below.

	Low degree of radical shift (1)						High degree of radical shift (7)
Gasoline car VS. Diesel car	1	2	3	4	5	6	7
iphone 4 VS. iphone 4s	1	2	3	4	5	6	7
Candle VS. Lamp	1	2	3	4	5	6	7
Pencil VS. Pen	1	2	3	4	5	6	7
Typewriter VS. Computer	1	2	3	4	5	6	7
Following the educating of radical innovation from Kyriakopoulos et al. (2016)							

33. Can you identify the most radical innovation in your industry during the past five years: _____

34. Can you describe the most radical innovation in your firm during the past three years: _____

Kyriakopoulos et al. (2016)

35. What is research and development (R&D) expenditure per year in your firm (approximate number)?_____
36. What is the total revenue per years in your firm (approximate number)?_____

R&D intensity from Singh and Gaur (2013)

37. How many patents have been granted to your firm in the past five years (approximate number)?_____

Innovation output from Duran et al. (2016)

Section C: Resources

39. With respect to your current understanding of your firm, how would you rate the level of resources held by your firm through the following:

	Low degree (1)						High degree (7)
Knowledge of competitors in this market.	1	2	3	4	5	6	7
Experience in doing business in this market.	1	2	3	4	5	6	7
Information and intelligence about the marketplace.	1	2	3	4	5	6	7
Knowledge of customers in this market.	1	2	3	4	5	6	7
Knowledge of the channel in this market.	1	2	3	4	5	6	7
Market knowledge from Kyriakopoulos et al. (2016)							
Brand name awareness	1	2	3	4	5	6	7
Distinctive of our brand image	1	2	3	4	5	6	7
The appeal of our brand 'personality.'	1	2	3	4	5	6	7
The strength of our brand image	1	2	3	4	5	6	7
Reputational resources from Morgan et al. (2003)							
Awareness of corporate name	1	2	3	4	5	6	7
The strength of our corporate image	1	2	3	4	5	6	7

Reputation of our corporation	1	2	3	4	5	6	7
Corporate reputational resources from Kyriakopoulos et al. (2016)							
Strength of existing customer/channel relationships	1	2	3	4	5	6	7
Quality of customer/channel relationships	1	2	3	4	5	6	7
Duration of relationships with current customers/channel	1	2	3	4	5	6	7
Closeness of existing customer/channel relationships	1	2	3	4	5	6	7
Relational resources from Kyriakopouls et al. (2016)							
Technical and scientific knowledge and information relevant to the industry	1	2	3	4	5	6	7
Patented knowledge relevant to the industry	1	2	3	4	5	6	7
New technical and scientific discoveries relevant to the industry	1	2	3	4	5	6	7
Relevant discoveries by our technical and scientific personnel	1	2	3	4	5	6	7
Technological resources from Kyriakopouls et al. (2016)							
Research and development	1	2	3	4	5	6	7
Industrial design	1	2	3	4	5	6	7
Engineering management	1	2	3	4	5	6	7
Information technology	1	2	3	4	5	6	7
Technological resource input from non-family firms study Fang (2008)							
Access to capital	1	2	3	4	5	6	7
The speed of acquiring and developing financial resources	1	2	3	4	5	6	7
Size of financial resources devoted to venture investment	1	2	3	4	5	6	7
Ability to find additional financial resources when needed	1	2	3	4	5	6	7
Financial resources from Morgan et al. (2006)							

Knowledge of our non-family personnel	1	2	3	4	5	6	7
The quality of our non-family personnel	1	2	3	4	5	6	7
Experience of our non-family personnel	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
Human resources from Morgan et al. (2006)							

40. How do you rate the relationship among you and your family members, family employees, and family business?

	Strongly disagree (1)						Strongly agree (7)
You and your family employees have a strong sense of belonging to your family business	1	2	3	4	5	6	7
You and your family employees feel that the family business' s success is your own success	1	2	3	4	5	6	7
Being a member of the family business helps define who we are	1	2	3	4	5	6	7
My family business has a great deal of personal meaning for family members	1	2	3	4	5	6	7
You and your family employees are proud to tell others that you are part of the family business	1	2	3	4	5	6	7
Customers often associate the family name with the family business's products and services	1	2	3	4	5	6	7
The majority of the shares in my family business are owned by family members	1	2	3	4	5	6	7
In my family business, family members exert control over the company's strategic decisions	1	2	3	4	5	6	7
In my family business, most executive positions are occupied by family members.	1	2	3	4	5	6	7

The board of directors is mainly composed of family members.	1	2	3	4	5	6	7
Preservation of family control and independence are important goals for my family business.	1	2	3	4	5	6	7
My family business is very active in promoting social activities at the community level	1	2	3	4	5	6	7
In my family business, non-family employees are treated as part of the family	1	2	3	4	5	6	7
In my family business, contractual relationships are mainly based on the trust and norms of reciprocity.	1	2	3	4	5	6	7
Building strong relationships with other institutions (i.e. other companies, professional associations, government agents, etc.) is important for my family business.	1	2	3	4	5	6	7
Contracts with suppliers are based on the enduring long-term relationships in my family business.	1	2	3	4	5	6	7
Emotions and sentiments often affect the decision-making processes in my family business.	1	2	3	4	5	6	7
Protecting the welfare of family members is critical to us, apart from personal contributions to the business	1	2	3	4	5	6	7
In my family business, the emotional bonds between family members are very strong.	1	2	3	4	5	6	7
In my family business, affective considerations are often as important as economic considerations.	1	2	3	4	5	6	7
Strong emotional ties among family members help us maintain a positive self-concept	1	2	3	4	5	6	7
In my family business, family members feel warmth for each other	1	2	3	4	5	6	7
Continuing the family legacy and tradition is an important goal for my family business.	1	2	3	4	5	6	7

Family owners are less likely to evaluate their investment on a short-term basis.	1	2	3	4	5	6	7
Family members would be unlikely to consider selling the family business	1	2	3	4	5	6	7
Successful business transfer to the new generation is an important goal for family members.	1	2	3	4	5	6	7
SEW FIBER measurement from Berrone et al. (2012)							
Among the number of previous investment cases, if the venture investment has been counted as promising in future, family investors are willing to accept financial losses within the first 5 years	1	2	3	4	5	6	7
Among the number of previous investment cases, family investors had a strong desire to acquire high performance out of a venture investment within the first 5 years.	1	2	3	4	5	6	7
Among the number of previous investment cases, family investors will exit if the benefits acquire from a venture investment did not meet their expectation (financial, marketing and sales performance) within the first 5 years	1	2	3	4	5	6	7
The pursuit of long-term (more than 5 years) family owners' value is likely to be associated with family owners' loyalty rather than exit	1	2	3	4	5	6	7
Family patient capital created based on Deeg and Hardies (2015)							
Family members spend time together on social occasions	1	2	3	4	5	6	7
Family members maintain close social relationships	1	2	3	4	5	6	7
Family members can rely on each other without any fear that some of them will take advantage even if the opportunity arises	1	2	3	4	5	6	7
Family members always keep the promises they make to each other	1	2	3	4	5	6	7
Family members share the same ambitions and vision	1	2	3	4	5	6	7
Family members are enthusiastic about pursuing the collective goals and missions of the whole organization	1	2	3	4	5	6	7
Family social capital measures from Chirico and Salvato (2014)							
In your current market, customers’ preferences change quickly over time	1	2	3	4	5	6	7
Market demand and consumer tastes in your market are unpredictable	1	2	3	4	5	6	7

Actions of competitors in the market have been highly unpredictable	1	2	3	4	5	6	7
Environmental dynamism from non-family firm study Fang (2008)							
Innovations that make your prevailing product obsolete	1	2	3	4	5	6	7
Innovations that fundamentally change your prevailing products	1	2	3	4	5	6	7
Innovations that make your existing expertise in prevailing products obsolete	1	2	3	4	5	6	7
Radical innovation capability from Subramaniam and Youndt (2005)							
There are many 'promotion wars' in our industry	1	2	3	4	5	6	7
For anything that one competitor can offer, others can match readily	1	2	3	4	5	6	7
Price competition is a hallmark of our industry	1	2	3	4	5	6	7
One hears of a competitive move almost every day							
Competitive intensity by Jaworski et al. (1993)							
We consider ourselves an innovative company	1	2	3	4	5	6	7
Our business is often first to market with new products and services	1	2	3	4	5	6	7
Competitors in this market recognize use as leaders in innovation	1	2	3	4	5	6	7
innovativeness by Filser et al. (2017)							
We are afraid of the situation regarding the majority of shares in the family business are owned by family members will be unlikely in the future	1	2	3	4	5	6	7
We are afraid of the situation regarding the most executive positions are occupied by family members will be unlikely in the future	1	2	3	4	5	6	7
We are afraid of the situation regarding the board of directors is mainly composed of family members will be unlikely in the future	1	2	3	4	5	6	7
We are afraid that family members will be unlikely to have a strong sense of belonging to the firm in the future	1	2	3	4	5	6	7
We are afraid that family members will be unlikely to feel that family business success is their own success	1	2	3	4	5	6	7
We are afraid of the situation regarding being a family member of the family business will be	1	2	3	4	5	6	7

unlikely to help define who we are							
We are afraid of the situation regarding family members are proud to telling others that we are part of the family business will be unlikely in the future	1	2	3	4	5	6	7
We are afraid of the situation regarding non-family employees are treated as part of the family will be unlikely in the future	1	2	3	4	5	6	7
We are afraid that the contractual relationships are mainly based on trust and norms of reciprocity will be unlikely in the future	1	2	3	4	5	6	7
We are afraid that building strong relationships with other institutions (i.e. other companies, professional associations, government agents will be unlikely important for the family business	1	2	3	4	5	6	7
We are afraid of emotions and sentiments will be unlikely to affect decision-making processes in the family business in the future	1	2	3	4	5	6	7
We are afraid of protecting the welfare of family members will be unlikely important to us in the future	1	2	3	4	5	6	7
We are afraid that affective considerations will be unlikely as important as economic considerations in the future	1	2	3	4	5	6	7
We are afraid of the situation regarding strong emotional ties among family members help us maintain a positive self-concept will be unlikely in the future	1	2	3	4	5	6	7
We are afraid of the continuing the family legacy and tradition will be unlikely an important goal for the family business in the future	1	2	3	4	5	6	7
We are afraid that we will be likely to consider selling the family business in the future	1	2	3	4	5	6	7
We are afraid of successful business transfer to the next generation will be unlikely important goals for the family business	1	2	3	4	5	6	7
We are afraid that the preservation of family control and independence will be unlikely important goals for the family business	1	2	3	4	5	6	7
Perception of maintaining SEW in the future Based on the measurement of Filser et al. (2017)							
We feel quite certain of the benefits we could expect to get if we adopted a radical innovation	1	2	3	4	5	6	7
We are quite sure of what the relevant trade-offs are among the costs and benefits of launching a new product	1	2	3	4	5	6	7
We will change the firms' behaviour significantly to attain the potential benefits of launching a	1	2	3	4	5	6	7

new product	
Launching a new product would allow my firm to acquire the competitive advantage that my firm cannot easily get now	1 2 3 4 5 6 7
Willingness to adopt innovation based on the non-family firm study Alexander et al. (2008)	

41. Please rate the degree to which the new product is:

Very ordinary for our industry	1	2	3	4	5	6	7	Very novel for our industry
Not challenging to existing ideas in our industry	1	2	3	4	5	6	7	Challenging to existing ideas in our industry
Not offering new ideas to our industry	1	2	3	4	5	6	7	Offering new ideas to our industry
Not creative	1	2	3	4	5	6	7	Creative
Uninteresting	1	2	3	4	5	6	7	interesting
Not capable of generating ideas for other products	1	2	3	4	5	6	7	Capable of generating ideas for other products
Innovativeness measures from non-family study Fang (2008)								

42. Please rate the degree to which the development speed of the new product is:

Far behind our time goals	1	2	3	4	5	6	7	Far ahead of our time goals
Slower than the industry norm	1	2	3	4	5	6	7	Faster than the industry norm
Much slower than we expected	1	2	3	4	5	6	7	Much faster than we expected
Behind where we would be had we gone it along	1	2	3	4	5	6	7	Ahead of where we would be had we gone it alone
Slower than our typical product development time	1	2	3	4	5	6	7	Faster than our typical product development time
The degree of how firms fit the environment from non-family study Fang (2008)								

43. How would you characterize the domestic environment within which your firm operates? Please base your response on your opinion about the characteristics of the domestic conditions (in the country where your company's headquarters are located) in the last 3 years

Very risky, a false step can mean our firms' undoing	1	2	3	4	5	6	7	Very safe, little threat to the survival and well-being of our firm
There are very few 'free' opportunities, it is very stressful, demanding, hostile, hard to keep afloat	1	2	3	4	5	6	7	There is an abundance of investment and marketing opportunities which can be easily exploited
A dominating environment in which our firm's initiatives count for very little against tremendous competitive, political, or technological forces	1	2	3	4	5	6	7	An environment that my firm can control and manipulate to its own advantage (an industry with little competition and few hindrances
Domestic environmental munificence scale from Debicki et al. (2016)								

44. What is the highest level of education you completed?

□ Did not complete high school

□ High school;

□ Some College;

□ Bachelor's Degree;

□ Master's Degree;

□ Advanced Graduate Work or PhD

45. To what extent do you feel you possess knowledge regarding the questions asked in this questionnaire?

No Knowledge (1)						Full Knowledge (7)
1	2	3	4	5	6	7

46. To what extent do you believe the responses given by you accurately reflect the 'realities' of your business' involvement in the facility within which you operate?

			Not at all accurate (1)			Very accurate (7)
1	2	3	4	5	6	7

47. Are you interested to see the summary report of the findings?
Yes □ No □

48. If you answered YES in question 47, could you please write your Email address down:

Thank you very much for completing this survey

APPENDIX B ONLINE SURVEY PART B

Dear Participant

My name is Qilin Hu, and I am studying for a PhD degree at Durham University in the UK. For this project, I am examining innovation in the family firm. Because you have experience of managing family firms, I am inviting you to participate in this research study by completing the attached survey. Your views will make vital contributions to Family Business Studies.

The following questionnaire will require approximately 50 minutes to complete. There is no compensation for responding nor is there any known risk. In order to ensure, that all information will be treated in the strictest confidence, please do not include your name. If you choose to participate in this project, please answer all questions by following your feeling and your immediate reaction. There are no right or wrong answers. Participation is strictly voluntary, and you may refuse to participate at any time.

Thank you for taking the time to assist me in my educational endeavours. The data collected will provide useful information regarding the family firm innovation study. As the compensation for your effort, if you would like a report of the research findings, please answer YES for question 47, and fill in your Email address question 48.

Sincerely,

Qilin Hu
Durham University Business School
Durham University
Mill Hill Lane
Durham DH1 3LB
Email: Qilin.hu@durham.ac.uk

1. What is the name of your firm?

1. What is your gender?
□ Male

□ Female

□ Prefer not to say

2. What is your age?

3. Which city is your company located? _____

4. What is your current position in your firm?_____

5. What is the age of your current firm?_____

6. How many employees are currently in your firm?_____

Family employees are defined as employees who have family relationships with each other, such as father, mother, son, brothers, sisters, cousins and so on. Non-family employees are defined as employees who do not have family relationships with current family members who dominate the company.

7. Are you one of the family members?

Yes □ No □

8. Do you have responsibility for strategic decision-making in the firm?
Yes □ No □

9. What is your ambition for the firm in the next 5 years?

□ maintain the status quo and sustain the current activities of the firm

□ grow your firm and focus on investment in new market

Section B: A general description of product innovation

Radical product innovation is searching for market potential and niches and creating something new. The new product is the breakthrough in the current product. There are examples demonstrating below.

Radical innovation example 1: Electric-powered cars replaced the gasoline power system of traditional cars with batteries. Electric car owners can charge the electric vehicle at home.

Radical innovation example 2: Online education has changed traditional education in terms of students should go to school to fulfil the academic obligation. St udents can take lectures and seminars at home, hand in the homework online, and eventually received certificate and qualification.

10. By referring to the given two radical innovation examples above, please identify and rate the radical shift between the pairs of products below.

	Low degree of radical shift (1)						High degree of radical shift (7)
Gasoline car VS. Diesel car	1	2	3	4	5	6	7
Candle VS. Lamp	1	2	3	4	5	6	7
Pencil VS. Pen	1	2	3	4	5	6	7
Typewriter VS. Computer	1	2	3	4	5	6	7

11. Can you identify the most radical innovation in your industry during the past five years:

12. Can you describe the most radical innovation in your firm during the past three years

13. What is research and development (R&D) expenditure per year in your firm (approximate number)?_____

14. What is the total revenue per years in your firm (approximate number)?_____

15. How many patents have been granted to your firm in the past five years (approximate number)?

16. Please rate how much you agree with the statements in below 1 = strongly disagree, 7 =strongly agree

We feel quite certain of the benefits we could expect to get if we adopted a radical innovation	1	2	3	4	5	6	7
We are quite sure of what the relevant trade-offs are among the costs and benefits of launching a new product	1	2	3	4	5	6	7
We will change the firms' behaviour significantly to attain the potential benefits of launching a new product	1	2	3	4	5	6	7
Launching a new product would allow my firm to acquire the competitive advantage that my firm cannot easily get now	1	2	3	4	5	6	7
Innovations that make your prevailing product obsolete	1	2	3	4	5	6	7
Innovations that fundamentally change your prevailing products	1	2	3	4	5	6	7
Innovations that make your existing expertise in prevailing products obsolete	1	2	3	4	5	6	7
We consider ourselves an innovative company	1	2	3	4	5	6	7
Our business is often first to market with new products and services	1	2	3	4	5	6	7
Competitors in this market recognize use as leaders in innovation	1	2	3	4	5	6	7
We have achieved firm profit goals over the past 2 years	1	2	3	4	5	6	7
We have achieved a better return on investment than in past years	1	2	3	4	5	6	7

17. With respect to your current understanding of your firm, how would you rate the level of increase in different aspects of your firm, 1=very little, 7= very large

increase of market share in past 2 years	1	2	3	4	5	6	7
increase in annual turnover over past 2 years	1	2	3	4	5	6	7
increase in total income over the past 2 years	1	2	3	4	5	6	7

18. According to your knowledge, please rate the degree to which a new technological product is launched by any firm within the current industry in general:

Very ordinary for our industry	1	2	3	4	5	6	7	Very novel for our industry

Not challenging to existing ideas in our industry	1	2	3	4	5	6	7	Challenging to existing ideas in our industry
Not offering new ideas to our industry	1	2	3	4	5	6	7	Offering new ideas to our industry
Not creative	1	2	3	4	5	6	7	Creative
Uninteresting	1	2	3	4	5	6	7	interesting
Not capable of generating ideas for other products	1	2	3	4	5	6	7	Capable of generating ideas for other products

19. What is the highest level of education you completed?

□ Did not complete high school

□ High school;

□ Some College;

□ Bachelor's Degree;

□ Master's Degree;

□ Advanced Graduate Work or PhD

20. To what extent do you feel you possess knowledge regarding the questions asked in this questionnaire?

No Knowledge (1)						Full Knowledge (7)
1	2	3	4	5	6	7

21. To what extent do you believe the responses given by you accurately reflect the 'realities' of your business' involvement in the facility within which you operate?

Not at all accurate (1)						Very accurate (7)
1	2	3	4	5	6	7

Thank you very much for completing this survey

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