

Innovation in family businesses : balancing economic and socioemotional objectives

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INNOVATION IN FAMILY BUSINESSES:
BALANCING ECONOMIC AND SOCIOEMOTIONAL OBJECTIVES

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INNOVATION IN FAMILY BUSINESSES:
BALANCING ECONOMIC AND SOCIOEMOTIONAL OBJECTIVES

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1. INTRODUCTION

1.1. THE FAMILY ENTERPRISE AND ENTERPRISING FAMILIES

Family enterprises are omnipresent. They constitute the oldest and still one of the world's dominant forms of business organization. While the majority of family enterprises are small- or medium-sized, some of the largest multinational companies are also family-controlled. In the United States for instance, influential families are present in more than one third of the 500 largest publicly traded firms accounting for a total of around one fifth of outstanding equity (Anderson and Reeb, 2003). Based on the definition that a family holds the majority ownership stake of a business, six to eight out of ten European enterprises are estimated to be family firms (Family Firm Institute, 2013). Statistics from the Stiftung Familienunternehmen (2011) show how the share of family firms declines with company size in Germany. Whereas 85% of all firms with 10 to 49 employees are family firms, this percentage drops to 58% for firms with 50 to 249 employees and to 36% for firms with 250 to 499 employees. Among companies with 500 or more employees, 27% are still classified as family firms. Overall, the group of family enterprises has a substantial influence on the global economy. Depending on the exact definition used, they account for up to an estimated 70% to 90% of the annual global gross domestic product (GDP) (Family Firm Institute, 2013).

Next to their involvement in established firms, families also contribute substantially to the creation of new enterprises. Entrepreneurs frequently receive financial support from their family members to fund a start-up endeavor. In the period between the mid-1990s and 2003, families and friends operating as angel investors provided \$271 billion to entrepreneurs worldwide, whereas venture capital firms only raised \$59 billion (Poza, 2010). Next to this enormous financial input, many families engage directly in the foundation of new enterprises, as illustrated by the considerable number of start-ups initiated by kinship-related founders (Brannon, Wiklund and Haynie, 2013; Chua, Chrisman and Sharma, 1999). In fact, representative data from the Kauffman Firm Survey on the 2004 start-up population in the United States suggests that about one in every seven of these businesses is majorly-owned by two or more members of the same family.

Despite the prevalence of family enterprises and enterprising families, scholarly interest in this form of organization remained limited until the mid-1990s. Since then, the field has seen a tremendous development and it has undeniably enriched the broader literatures of corporate governance and strategic management. While merely 35 family business articles were published in the year 1996 (the vast majority of which appeared in the journal *Family Business Review*), this number almost tripled to 95 in 2010 with frequent appearances in leading economics and management journals (De Massis et al., 2012). Regardless of this positive trend, ambiguity prevails about what exactly constitutes a family business (Schulze and Gedajlovic, 2010). Most scholars nowadays at least concur that the family must be the dominant coalition within the business exerting substantial influence on strategic decision-making (Chrisman, Chua and Sharma, 2005; Chua, Chrisman and Sharma, 1999). That usually implies that the majority of ownership is controlled by a single family and that multiple members of this family are involved in the business (Miller et al., 2007). While

this definitional approach is generally followed in this dissertation, the exact definition in the four studies of this dissertation varies somewhat depending on the specific formulation used in the respective dataset.

A useful graph for understanding the complexities and dynamics within a family enterprise is the Three Circle Model shown in Figure 1.1. It illustrates that the family enterprise consists of three independent but overlapping systems: The family, the owners and the business. As shown in the diagram, stakeholders in the family business can fall into any one of seven categories (e.g., category 4: family owners who are not employed by the business or category 5: Non-family owners who are employed by the business). Competing and often conflicting needs may arise between members of the different categories. Non-family owners who are not employed by the family firm (category 2) for instance, are likely to have a less emotional connection to the business than family owners who are paid employees (category 7).

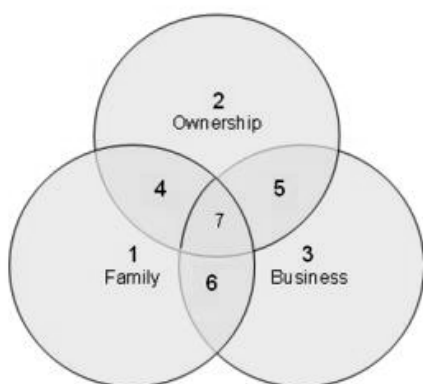


Figure 1.1: The Three Circle Model (Source: Adapted from Tagiuri and Davis, 1996)

The interplay of the different subsystems and the necessity to balance economic and non-economic objectives in the decision-making process make family businesses such a fascinating and fertile subject for researchers. Family firms possess distinct characteristics that can either create competitive advantages or disadvantages. A major dissimilarity between family and non-family firms pertains to the degree of long-term orientation. Families that own a business commonly have intentions for transgenerational control (Zellweger et al., 2012) which generally leads to a longer investment horizon in family enterprises (Zellweger, 2007). Persistent commitment by the family also facilitates the accumulation of tacit knowledge over time which is often passed on from one generation to the next. Besides these positive implications, stronger concerns for the continuity of the business may also come along with a strong desire for stability and resistance to change (Chirico and Salvato, 2008). In order to

preserve the discretion of the family in the decision-making process, family businesses tend to act more conservatively and to refrain from investments that may jeopardize the solidity of the firm (Miller, Le Breton-Miller and Lester, 2011). Other potential difficulties in family enterprises concern their challenges in finding a suitable successor for the enterprise and their proneness to nepotistic decisions which possibly harm the business.

An array of studies has set out to identify strategic differences between family and non-family enterprises (Gómez-Mejía et al., 2011). These studies have revealed substantial discrepancies regarding business decisions such as giving up independence by joining a cooperative (Gómez-Mejía et al., 2007), diversifying domestically and internationally (Gómez-Mejía, Makri and Larraza-Kintana, 2010) or devoting resources to stakeholder management (Berrone et al., 2010). From a theoretical viewpoint, the primary source of this heterogeneity is what family business scholars have termed socioemotional wealth (SEW; Gómez-Mejía et al., 2007). The concept of SEW is rooted in the behavioral theory of the firm and it refers to a set of non-financial benefits that families derive from controlling their business such as the ability to exercise personal control, clan membership, identity, the opportunity to be altruistic to family members and the perpetuation of the family dynasty. In their strategic decision-making, managers in family firms need to balance the objective to preserve non-economic benefits for the family with the business agenda (Chrisman et al., 2012). This dissertation investigates how the mixed set of objectives in family firms affects their innovation processes. Innovation is a critical business activity that combines the topics of strategy, entrepreneurship, and governance. It therefore provides abundant opportunities for family business research.

1.2. INTERNAL INNOVATION AND EXTERNAL INNOVATION PARTNERS

The word ‘innovation’ derives from the Latin word ‘novare’ meaning ‘to renew or change’. Innovation has been identified as a major catalyst for economic growth in market economies in the business and economics literature. Incumbent firms and entrepreneurs continuously look for better ways to satisfy consumers with improved products and services culminating in innovation. By introducing new products or services, organizations engage in ‘creative destruction’ (Schumpeter, 1942), a process in which new production units replace outdated ones. Innovation can occur in different forms such as product, service, process or organizational innovation. The studies in this dissertation primarily deal with product and service innovation but to a lesser extent also with process innovation. Furthermore, they examine internal (e.g., internal investments in innovation) and external sources of innovation (e.g., innovation partnerships with external parties) in family and non-family enterprises.

From an organizational viewpoint, innovation endeavors are a double-edged sword. On the one hand, innovation is a central source of competitive advantage in globalized markets characterized by intense competition. According to prior research, innovating firms have a higher likelihood of long-term survival (Cefis and Marsili, 2006) and they achieve superior organizational performance (Esteve-Pérez and Mañez-Castillejo, 2008). On the other hand, innovation activities are also associated with higher degrees of uncertainty regarding organizational outcomes (Pindyck, 1991; Shi, 2003). During the innovation process

organizations face technical uncertainties as to whether the new product or service will work, as well as market uncertainties as to whether the customer will pay for the innovation. Both of these uncertainties raise the risk exposure of an organization.

In the light of the elevated risk, many organizations refrain from intensive internal investments in innovation. Instead, they increasingly rely on external sources of innovation like customers, suppliers, competitors or research institutes. Such partnerships are attractive for firms aiming to combine knowledge, share costs or mitigate uncertainties in developing new products and services. Despite the potential merits, external innovation partnerships also introduce considerable challenges to organizations. Managing a diversified set of innovation partners requires cognitive and absorptive capacity, properties that are scarce in many firms. Moreover, some organizations hesitate to accept the loss of autonomy related to partnering up in the innovation process. As a result, the degree of openness towards external innovation partners also varies substantially across organizations.

1.3. INNOVATION IN THE FAMILY ENTERPRISE

Due to their continuing prevalence, family firms will play a central role in generating innovations in the 21st century (Astrachan and Shanker, 2003). The current increase in scholarly interest regarding potential differences between innovation in family and non-family businesses hence comes as no surprise (De Massis, Frattini and Lichtenthaler, 2013a). The desire to balance economic and socioemotional objectives in family firms can either have positive or negative implications for particular aspects of the innovation process. On the one hand, family enterprises share a unique bundle of resources that can create distinct advantages to the innovation process. Long-term orientation (Zellweger, 2007), stewardship behavior (Eddleston and Kellermanns, 2006) and informal sharing of knowledge (Zahra, 2012) are exemplary features of family firms that can stimulate learning and innovation. On the other hand, family firms are also frequently associated with conservatism and risk-averse strategic behavior potentially constraining their degree of innovativeness (Block et al., 2013; Miller et al., 2011).

The majority of empirical studies investigating discrepancies between the innovation processes of family and non-family firms focus on research and development (R&D) investments in large and publicly-traded corporations. This stream of research consistently shows that family firms invest less intensively into R&D than their non-family counterparts (Block, 2012; Chrisman and Patel, 2012; Patel and Chrisman, forthcoming). In contrast, no prior study has compared the innovation investment intensity of family and non-family SMEs. Likewise, the innovation investments of family and non-family start-ups have not received any attention in the literature. Neglecting these groups of firms is problematic given the benefits of innovation for small and young firms (Hall, Lotti and Mairesse, 2009; Rosenbusch, Brinckmann and Bausch, 2011; Terziovski, 2010) and their vital contribution to the innovation potential of an economy (Audretsch, 2002; Roper, 1997). In addition, findings from research on large and public family firms are not easily transferable to family SMEs or family start-ups.

Prior studies likewise ignored potential dissimilarities between the level of process innovation in family versus non-family firms. Yet, it is essential to consider not only product but also process innovation differences, because companies may follow different innovation strategies emphasizing either one of the two innovation types. Lastly, external aspects of the innovation process such as characteristics of the innovation partner network or the governance mechanisms used in innovation partnerships had been neglected by scholars prior to this dissertation. This has led to an incomplete depiction of innovation in family businesses. Therefore, this dissertation aims to extend the stream of empirical research in this area by examining internal and external elements of the innovation process primarily in smaller, privately-held family and non-family businesses.

1.4. RESEARCH QUESTION AND OUTLINE

The objective of this dissertation is to enhance our understanding of the particularities of internal and external innovation activities in family firms. The overarching research question can hence be formulated as follows: *How do internal innovation processes and the use of external innovation sources differ between family and non-family enterprises?* In order to address this issue systematically, the question was broken down into a number of sub-questions. Specifically, this dissertation seeks answers to the following set of sub-questions:

- How does the probability of investing in innovation differ between family and non-family SMEs?
- How intensively do family vis-à-vis non-family SMEs invest in innovation?
- How do product and process innovation outputs differ between family and non-family SMEs controlling for the level of innovation input?
- Are family SMEs more or less productive controlling for the level of product and process innovation output?
- How intensively do family versus non-family start-ups invest in R&D?
- How do start-ups adjust their R&D investment intensity following declining performance?
- How does the R&D investment intensity in response to declining performance differ between family and non-family start-ups?
- How do family and non-family firms differ with respect to their diversity of innovation partner types?
- Which factors influence the level of innovation partner diversity among the group of family firms?
- How do family and non-family firms differ with respect to their degree of openness towards external innovation partnerships across innovation stages?
- Are family firms more or less likely to rely on contracts as a form of governance in their innovation partnerships?

The principal relationships investigated in this dissertation are summarized in Figure 1.2.

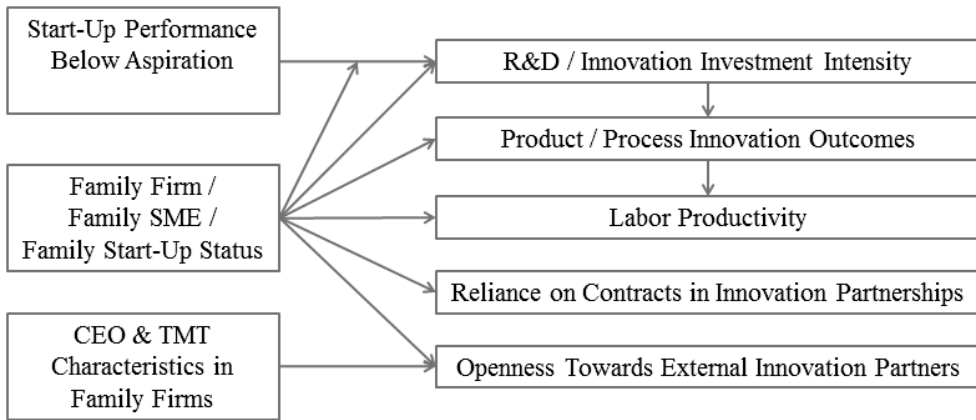


Figure 1.2: Research Model of the Entire Dissertation

Each of the following chapters addresses one or more of these links. While *Chapter 2* and *Chapter 3* focus on internal parts of the innovation process, *Chapter 4* and *Chapter 5* primarily deal with aspects related to the use of external innovation sources. *Chapter 2* compares 2,087 German family and non-family SMEs regarding the probability of innovation investment, the innovation intensity, the product and process innovation outcomes and the level of labor productivity. The data is secondary data from the Mannheim Innovation Panel. *Chapter 3* looks at the R&D investment intensity of 912 family and non-family start-ups in the U.S., as well as their response to underperformance. The Kauffman Firm Survey is used as data source in this article. *Chapter 4* examines the number of external innovation partner types used in 170 family and non-family SMEs located in Belgium or the Netherlands. Moreover, it investigates potential sources of search breadth heterogeneity among family SMEs. Primary data on manufacturing SMEs serves as a basis for the quantitative analysis in this study. Finally, *Chapter 5* deals with the degree to which 508 German manufacturing firms open up their innovation processes, again comparing family and non-family businesses. In addition, the study also examines the extent to which family and non-family businesses rely on formal contracting as a governance mechanism in these innovation partnerships. Like in *Chapter 2*, the Mannheim Innovation Panel serves as a data source for this chapter.

1.5. DISSEMINATION OF RESEARCH

All four quantitative empirical chapters of this dissertation are based on self-contained articles that have either been accepted for publication in, or have been submitted to international peer-reviewed journals. Earlier versions of these papers have been presented at a number of international conferences and research seminars such as the Academy of Management (AOM) conferences in 2011, 2012 and 2013 (*Chapter 2*, *Chapter 4* and *Chapter 5*), the Babson conference in 2013 (*Chapter 3*), the International Family Enterprise Research Academy (IFERA) conferences in 2011, 2012 and 2013 (*Chapter 2*, *Chapter 3* and *Chapter 5*), the Inscope conference in 2011 (*Chapter 4*), the RENT conference in 2010 (*Chapter 2*), the EFMD conference in 2012 (*Chapter 2*), the CYFE Young Researchers Workshop on Family

Business and Innovation in 2012 (*Chapter 3*), the 6th EIASM Workshop on Family Firms Management Research in 2010 (*Chapter 4*), the SEI Doctoral Consortium in 2012 (*Chapter 3*), the NYU / Columbia Business School Doctoral Conference in 2013 (*Chapter 5*), as well as research seminars at Centre for European Economic Research (*Chapter 2*), Columbia Business School (*Chapter 3*), KU Leuven (*Chapter 3*) and Rotterdam School of Management (*Chapter 3*). The corresponding articles or working papers are listed below.

Chapter 2 (published):

Classen, N., Carree, M., Van Gils, A., and Peters, B. (forthcoming). Innovation in family and non-family SMEs. *Small Business Economics*. DOI: 10.1007/s11187-013-9490-z.

Chapter 3 (revise and resubmit):

Classen, N., and Carree, M. (2013). R&D investment in family and non-family start-ups: A behavioral perspective. (Current status: Revise and resubmit at *Strategic Entrepreneurship Journal*)

Chapter 4 (published):

Classen, N., Van Gils, A., Bammens, Y., and Carree, M. (2012). Accessing resources from innovation partners: The search breadth of family SMEs. *Journal of Small Business Management* 50(2), 191–215.

Classen, N., Van Gils, A., Bammens, Y., and Carree, M. (2011). Cooperation and external resource acquisition: The search breadth of family and non-family SMEs. In Leslie A. Toombs (Ed.), *Academy of Management Best Paper Proceedings*.

Chapter 5 (revise and resubmit):

Classen, N., and Bammens, Y. (2013). Innovation openness and partnership governance: Comparing family-controlled and non-family firms. (Current status: Revise and resubmit at *Journal of Product Innovation Management*)

2. INNOVATION IN FAMILY AND NON-FAMILY SMES: AN EXPLORATORY ANALYSIS¹

Abstract

This study provides an exploratory analysis of differences between family and non-family firms in innovation investment, product and process innovation outcomes and labor productivity. Using data from the Community Innovation Survey on 2,087 German small- and medium-sized enterprises (SMEs), we observe significant disparities at each stage of the innovation process. Whereas family SMEs have a higher propensity to invest in innovation at all, conditional on investing in innovation, these companies do so less intensively than their non-family counterparts. Family SMEs further tend to outperform non-family SMEs in terms of process innovation outcomes when controlling for innovation investment. Given the level of product and process innovation, however, family SMEs underperform regarding labor productivity in comparison to non-family SMEs. These findings complement previous empirical research by illustrating how the presence of a dominant family relates to innovation inputs and outputs of SMEs in Europe's largest economy and its innovative SME sector.

¹ This chapter is based on the following article: Classen, N., Carree, M., Van Gils, A., and Peters, B. (forthcoming). Innovation in family and non-family SMEs: An exploratory analysis, *Small Business Economics*. DOI: 10.1007/s11187-013-9490-z.

Nicolas Classen acknowledges financial support from the Strike network and data support from the Centre for European Economic Research (ZEW) in Mannheim. All authors would like to thank the Associate Editor Joern Block and the two anonymous reviewers for their insightful comments and suggestions during the review process. Prior versions of this paper have been presented at the 2012 annual meeting of the Academy of Management in Boston, the 2012 EFMD conference in Maastricht, the 2011 Ifera conference in Palermo, and at the Centre for European Economic Research in Mannheim 2011.

2.1. INTRODUCTION

Differences between the innovation processes of family versus non-family firms have become an important area of research in the management and economics literature (De Massis et al., 2013a). Innovation endeavors are generally expected to increase long-term economic performance, but they also entail substantial risks, because the bulk of expenses is irreversible, and future payoffs are uncertain (Shi, 2003). Although family business owners are generally known for their long-term orientation (Zellweger, 2007), they tend to avoid excessive risks associated with R&D-intensive innovation strategies (Miller et al., 2011).

A substantial share of empirical studies in this research field focuses on differences between R&D investments in large and publicly traded family versus non-family firms (Block, 2012; Chen and Hsu, 2009; Chrisman and Patel, 2012; Munari, Oriani and Sobrero, 2010; Muños-Bullón and Sanchez-Bueno, 2011; Patel and Chrisman, forthcoming). By contrast, no prior study has investigated such differences in an SME setting (Benavides-Velasco, Quintana-García and Guzmán-Parra, 2013). This is surprising given the prevalence of family SMEs², defined as firms with 10–250 employees and majority ownership held by a single family, in innovative economies such as Germany. Previous research comparing innovation outcomes in family and non-family firms is also limited. The few findings concerning product innovation outcomes are furthermore very mixed, and the potential relevance of process innovation outcomes in family firms has been ignored entirely. In addition, potential interdependencies between different stages of the innovation process have typically been neglected (for a notable exception, see Block et al., 2013).

Our exploratory analysis addresses these shortcomings by answering the question how family and non-family SMEs differ across multiple interdependent stages of the innovation process. This includes the decision to invest in innovation, the amount of innovation investment and innovation outcome, but also the economic impact of innovation. Analyzing these discrepancies is particularly intriguing for the German economy, which hosts the most innovative SME sector in the entire European Union (EU) (European Commission, 2012). Germany heads the ranking of all 27 member states in the European Union (EU) on the indicators of SMEs innovating in-house and SMEs introducing product or process innovations (European Commission, 2012). The country further ranks eighth out of 139 countries for innovation in the World Economic Forum's (WEF) Global Competitiveness Report 2010-2011, being the international leader in terms of capacity for innovation and occupying fourth place for company spending on R&D. According to Simon (2009), Germany's innovation capacity is primarily driven by a multitude of so-called 'Hidden Champions', mostly midsize (family) enterprises with relatively low public awareness. While family firms are often held responsible for the innovation success of the German 'Mittelstand' (European Commission, 2012), this notion contradicts with the bulk of empirical evidence suggesting lower innovation investments and lower patent quality of large family firms (e.g., Block, 2012; Block et al., 2013; Chrisman and Patel, 2012; Munari, Oriani and Sobrero, 2010). Hence, our research will

² According to the Stiftung Familienunternehmen (2011), the share of family firms in Germany (based on the definition that a family owns the majority of shares or votes in a firm) varies as follows across different size classes (number of employees): 0–9 : 94%, 10–49: 85%, 50–249: 58%, 250–499: 36%, >=500: 27%.

help develop a clearer understanding of the specific advantages and deficits of family SMEs during the innovation process.

Specifically, we first investigate how the presence of a dominant family influences the propensity of SMEs to invest in innovation, as well as the intensity of these investments. Studying differences between the innovation investment strategies of family and non-family SMEs is essential given the merits of innovation for smaller firms (Hall et al., 2009; Rosenbusch, Brinckmann and Bausch, 2011; Terziowski, 2010) and their crucial contribution to the innovation potential of an economy (Audretsch, 2002; Roper, 1997). Moreover, findings from studies on large and public family firms are hardly transferable to family SMEs. Small family firms are characterized by a concentration of ownership that increases the power of the dominant coalition to impose its will upon the firm compared to larger firms (Chrisman et al., 2012). Finally, we generate a more nuanced picture of innovation investment strategies in family and non-family firms by splitting the innovation input stage into two parts, which also avoids a potential selection bias from focusing only on firms that invest in innovation.

Following the innovation investment stage, we compare innovation outcomes of family and non-family SMEs, controlling for innovation input intensity. In contrast to prior research, we study both product and process innovation success. This is important because companies may pursue distinct innovation strategies emphasizing either one of the two innovation types. Likewise, potential interdependencies across innovation stages may give rise to interpretation biases. Product and process innovation may both improve labor productivity (Griffith et al., 2006; Hall et al., 2009). While product innovations aim at increasing the amount of sales, process innovations are often initiated to decrease the required level of labor input. So, in case family firms deviate from non-family firms, there might be direct and indirect effects of family firm status on productivity. The literature has not yet distinguished between these two types of effects on firm performance.

To our knowledge this is also the first family business study using data from the Community Innovation Survey (CIS). CIS data are periodically collected in the Member States of the European Union to obtain information on innovation activities. We provide new empirical evidence by employing the so called CDM model³, a stepwise econometric model that describes the link between innovation input, innovation output and economic performance (Crépon, Duguet and Mairesse, 1998). A novel finding of our study, based on 2,087 family and non-family SMEs, is that family SMEs have a higher propensity to invest in innovation at all. Conditional on investing in innovation, however, they do so less intensively than their non-family counterparts confirming the pattern that has been found for large family firms. Family SMEs further tend to outperform non-family SMEs in terms of process innovation outcomes when controlling for innovation investment. Finally, given the level of product and process innovation, family SMEs underperform regarding labor productivity in comparison to their non-family counterparts. Contrary to previous studies, we are able to show that this negative direct effect is accompanied by more positive indirect effects via innovation outputs. We discuss important empirical and theoretical implications for further research, as well as practical implications for policy makers and managers.

³ See Mairesse and Mohnen (2010) for an overview of recent studies using the CDM model.

The article proceeds as follows. The next section provides a brief overview of the prior research on innovation in family firms with the focus on empirical research. Section 3 contains the description of our data and the empirical approach. We present the results of our empirical analysis in Section 4, discuss them in Section 5 and conclude in Section 6.

2.2. PREVIOUS EMPIRICAL STUDIES ON INNOVATION IN FAMILY FIRMS

The unique combination of economic and non-economic goals in family businesses influences their strategic firm behavior (Chrisman et al., 2012; Zellweger et al., 2011). Prior research has empirically verified the distinct strategic choices of family businesses (see Gómez-Mejía et al., 2011 for a recent overview). Studies on the innovation input⁴ intensity in family firms are recurrent within this literature consistently finding a lower level of innovation investments in family firms compared to non-family firms (De Massis et al., 2013a). An emerging explanation is that family owners are loss averse with respect to the non-financial utility they derive from their business, making them risk averse to business opportunities that might reduce that utility (Patel and Chrisman, forthcoming). Given that R&D expenditures are sunk costs with uncertain payoffs, family firms tend to pursue conservative innovation strategies associated with less intensive R&D investments (Miller et al., 2011).

Based on a sample of publicly held firms from the Standard & Poor's 1500 between 1998 and 2007, Chrisman and Patel (2012) find that family firms invest less into R&D than non-family firms. The authors further demonstrate that these investments are subject to adjustments in case family firm performance falls below or above performance (Chrisman and Patel, 2012; Patel and Chrisman, forthcoming). Using a sample of firms listed in the Standard & Poor's 500, the findings of Block (2012) also point to a negative effect of family ownership on R&D intensity. Lower levels of R&D investment in family firms are equally observed by Chen and Hsu (2009) among listed Taiwanese corporations, by Muños-Bullón and Sanchez-Bueno (2011) focusing on publicly traded Canadian firms and by Munari, Oriani and Sobrero (2010) using a sample of publicly-traded firms in six European countries. All these studies use samples of large, public enterprises, and they do not consider differences between family and non-family firms regarding the probability of investing in innovation at all.

Previous research on innovation outcomes in family and non-family firms provides less unambiguous findings. These inconsistencies can partly be explained by the variety of innovation output indicators. Studies looking at patent data generally show a negative relationship between family involvement and innovation outcomes. In a recent work on firms from the S&P 500 Block and colleagues (2013) find that family ownership has a negative effect on the number of patent citations, an indicator for the economic and technological importance of innovations. The authors argue that the pursuit of socioemotional wealth for the family may conflict with the realization of ambitious innovation projects. This is in line with findings from studies indicating a lower level of entrepreneurial orientation (especially risk-taking) in family businesses (e.g., Naldi et al., 2007). As a consequence, family firms tend to

⁴ In accordance with the CIS, we define innovation expenditures as money spent on internal and external R&D or the acquisition of external resources to realize innovation projects.

select modest innovation strategies that are less likely to challenge family financial and managerial control (Classen et al., 2012; De Massis et al., 2013b). The studies by Chin et al. (2009) and Czarnitzki and Kraft (2009) likewise suggest that the ownership structure of family firms inhibits their innovativeness. Using a sample of Taiwanese publicly listed firms from the electronics industry, Chin et al. (2009) receive support for their hypotheses that the presence of a dominant family is negatively associated with patent quantity and quality. Based on an unbalanced panel data of manufacturing firms, Czarnitzki and Kraft (2009) find that companies with widely held capital stock have more patent applications than companies with concentrated ownership like in family firms.

In contrast to these findings, other studies looking at the introduction of new products or services portray a more positive link between family involvement and innovation outcomes. The central argument in these papers is that family firms possess unique resources and characteristics that benefit the implementation of innovation. Exemplary characteristics of family firms that stimulate learning and innovation are their long-term orientation (Zellweger, 2007), their stewardship behavior (Eddleston and Kellermanns, 2006) or their informal sharing of knowledge (Zahra, 2012). Using a large sample of firms across 47 developing economies, Ayyagari and colleagues (2011) find that family firms introduce more new products than non-family firms. The research of Gudmundson, Tower and Hartman (2003) also shows a positive relationship between family ownership and the ability to introduce new products and services. The studies of Westhead (1997) and of Craig and Dibrell (2006) provide similar empirical indications of superior innovation in family businesses. In sum, the findings on product innovation outcomes are mixed, and empirical evidence on process innovation differences is missing.

Finally, prior research concerning differences in the labor productivity of family and non-family firms is equally scattered and inconclusive (Barbera and Moores, forthcoming). On the one hand, studies observing higher productivity levels in family firms claim that family firms make more efficient use of their labor and capital resources. The research of McConaughy and colleagues (1998) shows a positive impact of family control on productivity, and this positive effect on sales per employee is higher in descendent-controlled firms than in founder-controlled firms. Based on a sample of French listed firms, Sraer and Thesmar (2007) ascertain that family firms largely outperform widely held corporations. Using data on S&P 500 manufacturing firms, Martikainen, Nikkinen and Vähämaa (2009) equally find that family firms are more productive than comparable non-family firms.

On the other hand, some studies find that particularly second and later-generation family firms perform relatively poorly compared to non-family firms. This productivity gap is either explained by lower skill levels in family-controlled firms or by the deliberate choice of owning families to sacrifice productivity, if this is necessary to derive socioemotional utility. Barth, Gulbrandsen and Schone (2005) analyze survey data on Norwegian firms showing that family-owned firms are less productive than non-family-owned firms. In a sample of CEO successions in limited liability (publicly and privately held) firms in Denmark, Bennedsen et al. (2007) find that family successions have a large negative causal impact on firm performance. Using proxy data on Fortune 500 firms, Villalonga and Amit (2006) find that family ownership creates value only when the founder serves as CEO of the family firm or as

chairman with a hired CEO. When descendants serve as CEOs, firm value is diminished. Overall, these inconsistent findings mainly based on large companies warrant additional research within more specified contexts (e.g., the SME context) to restrict firm heterogeneity. Likewise, potential indirect effects via innovation outcomes may exist that have been neglected so far.

2.3. METHOD

2.3.1 Sample

We use data from the Mannheim Innovation Panel (MIP), which is the German contribution to the European Community Innovation Surveys (CIS). The MIP is the annual German innovation survey conducted by the Centre for European Economic Research (ZEW) on behalf of the Federal Ministry of Education and Research since 1993. Nowadays, comparable innovation surveys are conducted in most OECD countries. They are based on common definitions and methodologies laid down in the Oslo manual (OECD and Eurostat, 2005). This type of data allows us to draw an encompassing picture of differences within the innovation processes of family and non-family businesses in the largest European economy. It is a representative stratified survey among manufacturing and service sector firms in Germany. We linked the MIP data to the firm database of the credit rating agency *Creditreform* to add complementary information about credit ratings and the age of a firm. Additionally, we retrieved and merged information on industry concentration in Germany from the report of the *Monopolkommission* (2008).

Our study focuses on the cross wave 2006 (CIS2006) in which the MIP survey for the first (and up till now last) time contained a question about the family ownership status. Out of 29,985 contacted enterprises, a total of 5,551 companies replied to the questionnaire, resulting in a response rate of 18.51%. In order to check for a potential non-response bias, telephone interviews were conducted with 4,656 non-responding firms. A probit estimation controlling for size and industry shows no significant differences between the probability of innovating between response and non-response firms.

From the sample of respondents, we omit those firms that did not answer the question on family ownership ($n = 167$). Due to our deliberate focus on SMEs, we further exclude all firms with less than 10 or more than 250 employees following the general definition provided by the European Commission ($n = 1,937$)⁵. In order to ensure comparability, we further leave out all firms from the sectors banking, insurance and research and development ($n = 196$). Banking and insurance companies have productivity measures that are hardly comparable to any other industry. Research and development companies by definition generate abnormally high percentages of sales from innovative products or services. Finally, observations with missing values for major variables were omitted ($n = 1,164$). This leaves us with a final sample of 2,087 SMEs.

⁵ To check the robustness of our results, we reran the entire model adopting the definition of SMEs used in the US (10–500 employees). The sample size increases from 2,087 to 2,323 firms but there is no qualitative difference in the results; all family SME effects are confirmed.

2.3.2 Econometric Model

This study introduces a structural approach to family versus non-family business innovation. It is based on the empirical research line started by Crépon, Duguet and Mairesse (1998) who proposed and estimated a model – the CDM model henceforth - that establishes a link between innovation input, innovation output and firm performance measured in terms of productivity. Several important advantages of the model explain why it has become so popular among scholars. First, it is a stylized model of companies' innovation processes, specifically developed to exploit innovation survey data on various aspects in multiple stages of innovation. Second, it uses appropriate estimation techniques to take into account the nature of innovation data. More precisely, the model controls for potential selection or endogeneity biases, and it considers that some dependent variables are censored, meaning that ordinary least-squares regressions are not appropriate. Owing to the increased diffusion of this kind of micro data across countries and among scholars, many empirical explorations of the impact of innovation on productivity have relied on the CDM framework (e.g., Griffith et al., 2006). For our research, the CDM model has the benefit of revealing the direct and indirect influence of the family SME status on innovation outcomes and productivity of SMEs.

Similar to the original CDM model, we rely on a three-step structural model. More specifically, we follow the econometric approach used by Lööf and Heshmati (2002; 2006) and Peters (2008). The first step of the model is to estimate a generalized Tobit model consisting of two equations, a probit equation for whether a firm invests in innovation or not and a regression equation predicting the innovation intensity of a firm including the inverse Mill's ratio generated from the probit estimation as a predictor. By this, we control for a potential selection bias (Heckman, 1979) that may arise because not all firms engage in innovation and the innovating subsample might not be a random sample of all firms. Let y_{1i}^* be a latent unobserved endogenous variable measuring the propensity to invest in innovation:

$$y_{1i}^* = \beta_1 x_{1i} + \gamma_1 f_i + \varepsilon_{1i} \quad (1)$$

The propensity to invest in innovation depends on several observable explanatory variables summarized in the vector x_{1i} , on the family business dummy variable f_i and on some unobservable variables summarized in the idiosyncratic error ε_{1i} . Innovation expenditures are defined as all expenditures including labor cost and investments for activities concerning the development and introduction of product and process innovations⁶. A firm actually invests in innovation only if the incentives to innovate for firm i exceed a certain constant threshold level⁷. y_{1i} is the observed binary variable indicating whether firm i is engaged in innovation activities or not:

⁶ Specifically, this encompasses all internal and external R&D expenditures, acquisition of advanced machinery, facilities, software and external knowledge to realize innovation projects, product design, construction, design of services and other preparations for the production/sale and distribution of innovations, internal or external training specifically for innovation projects, and launch of innovations onto the market (marketing campaigns directly linked to product innovations). Organizational innovation is not included.

⁷ Without any loss of generality, we assume that the threshold is zero.

$$y_{1i} \begin{cases} = 1 & \text{if } y_{1i}^* > 0 \\ = 0 & \text{if } y_{1i}^* \leq 0 \end{cases} \quad (1')$$

Conditional on deciding to invest in innovation, the innovation intensity denoted as y_{2i} is explained by equation (2). It is measured as the amount of innovation investment per employee in 2006 (in natural logarithm).

$$y_{2i} = \beta_2 x_{2i} + \gamma_2 f_i + \varepsilon_{2i} \quad (2)$$

In line with Crépon, Duguet and Mairesse (1998) we use the same set of explanatory variables in the selection and the innovation intensity equation⁸. We assume that ε_{1i} and ε_{2i} are bivariate normal with mean zero, variances $\sigma_1^2 = 1$ and $\sigma_2^2 = 1$ and correlation coefficient ρ .

The second step consists of two separate knowledge production functions explaining product innovation output and process innovation output. Product innovation output is measured in terms of sales per employee in 2006 from products/services newly introduced or significantly improved between 2004 and 2006 (in natural logarithm). Process innovation output is defined as the average percentage of cost reduction in unit costs due to process innovations in 2006. In case a firm i has decided to invest in innovation, the following equations reflect the transformation process from innovation input to product innovation output (y_{3i}) and process innovation output (y_{4i}). Next to the reported expenditures, other less formal investments may contribute to the innovation success of a firm. We test whether outside of an indirect effect via innovation input, a family effect may be present at the innovation output stage. However, not all firms that invest in innovation introduce new product or process innovations. We only observe the respective innovation outputs on the condition that firm i launched at least one new product innovation or one process innovation. We consider the fact that the variables are censored by estimating the following Tobit models:

$$y_{3i} = \begin{cases} y_{3i}^* = \alpha_1 y_{2i} + \beta_3 x_{3i} + \gamma_3 f_i + \varepsilon_{3i} & \text{if } y_{3i}^* > 0 \\ 0 & \text{if } y_{3i}^* \leq 0 \end{cases} \quad (3)$$

$$y_{4i} = \begin{cases} y_{4i}^* = \alpha_2 y_{2i} + \beta_4 x_{4i} + \gamma_4 f_i + \varepsilon_{4i} & \text{if } y_{4i}^* > 0 \\ 0 & \text{if } y_{4i}^* \leq 0 \end{cases} \quad (4)$$

Finally, like the majority of CDM applications, we use an innovation-augmented Cobb-Douglas production function to estimate the labor productivity of a firm. It describes the relationship between productivity (measured as the natural logarithm of total sales per employee) and knowledge produced, proxied by product and process innovation output, the family firm dummy and several other explanatory variables x_5 :

$$y_{5i} = \alpha_3 y_{3i} + \alpha_4 y_{4i} + \beta_5 x_{5i} + \gamma_5 f_i + \varepsilon_{5i} \quad (5)$$

⁸ Using the same set of regressors in the selection and the outcome equation of the Heckman model requires the selection equation to be non-linear (Cameron and Trivedi, 2010). Testing for this we found clear evidence for non-linearity indicating that the identification of our model need not rely on exclusion restrictions.

We assume a recursive structure in model equations (2) to (5). We account for possible simultaneity issues by means of the predicted value approach. In particular, we apply the instrumental variable Tobit approach to estimate equations (3) and (4) and use the predicted value from the innovation intensity equation (2) as instrument. Further, equation (5) is estimated using an instrumental variable approach. Here the predicted values from equation (3) and (4) serve as instruments for product innovation output and process innovation output.

2.3.3 Measures

Table 2.1 provides a detailed description of all dependent and independent variables used in the analysis. There is no consensus on the definition of a family business in the literature. Chrisman, Chua and Sharma (2005) differentiate between definitions focusing on components of family business, such as ownership or management, and those focused on what is a family business, such as the intent of the family to keep control or the idiosyncratic firm behavior arising from family involvement (see De Massis et al., 2012 for a recent overview). Yet, most family business scholars agree that the family must be the dominant coalition within the firm with authority over corporate decision-making (Chrisman et al., 2005; Chua, Chrisman and Sharma, 1999). This usually entails a single family holding a substantial fraction of the company's shares and numerous studies have used this single criterion to categorize firms into family and non-family-owned businesses (e.g., Ang, Cole and Lin, 2000; Barth, Gulbrandsen and Schone, 2005; Chu, 2009; Holderness and Sheehan, 1988; Maury, 2006). The chosen threshold level of family ownership varies considerably across studies. Ownership stakes of 5 or 10% serve as the threshold level among large and publicly traded family firms, whereas studies on SMEs typically require a family to hold the majority of shares in order to qualify the business as family-owned (Gómez-Mejía et al., 2011). We accordingly define a firm as a family SME if the majority of shares is owned by members of a single family. Specifically, family firms were identified based on the following survey question: "Is your enterprise controlled by a family - or part of an enterprise group controlled by a family? In case of an enterprise controlled by a family, family members hold at least 50% of the company's shares." The formulation "family members" implies that lone founder firms in which no relatives of a founder are involved should not be classified as family firms. To identify differences between family and non-family firms at each stage of the innovation process, we incorporate the family SME dummy as a predictor in each of the five regressions.

Our selection of control variables follows previous research using the CDM model (e.g., Hall et al., 2009). We include industry dummies, firm size, East Germany⁹, affiliation to a national and international group (reference: unaffiliated firms), firm age and human capital (percentage of employees with university or college degree) as controls in all equations¹⁰.

⁹ Even 20 years after reunification, structural economic differences still persist between the formerly separate entities of East and West Germany. Hence, we control for these regional differences within our analysis.

¹⁰ In addition to the variables discussed in the text, we have included dummy variables for several control variables which indicate missing values. In all cases, when the missing values indicator has a value of one, the corresponding variable is coded zero.

TABLE 2.1
Description of Variables

Variable Name	Explanation
Probability of investing in innovation	Dummy variable (=1, if the firm reports positive innovation expenditure in 2006)
Innovation intensity	Innovation expenditure per employee in thousand € in 2006 (in log.); please see footnote 5 for the detailed definition
Product innovation output	Sales per employee in 2006 from products/services newly introduced or significantly improved between 2004 and 2006 (in log.)
Process innovation output	Average percentage of cost reduction in unit costs due to process innovations in 2006
Labor productivity	Sales per employee in 2006 (in log.)
Family SME	Dummy variable (=1, if members of the same family hold at least 50% of the company's shares in 2006)
Firm size	Number of employees in 2005 (in log.)
East Germany	Dummy variable (=1, if the firm is located in East Germany)
National group	Dummy variable (=1, if the firm is part of a national enterprise group)
International group	Dummy variable (=1, if the firm is part of a multinational enterprise group)
Firm age	Age of the company (years; in log.)
Industry concentration	Herfindahl-Hirschman Index divided by 100 (to get appropriately scaled coefficients) in 2005
Export intensity	Percentage of sales that was generated from exports in 2005
Human capital	Percentage of employees with university or college degree in 2005
Credit rating	Index in 2005, ranging from 1 (highest creditworthiness) to 6 (lowest creditworthiness)
Market share	Market share of the number one product/service in 2006
Product/service diversification (inverse)	Percentage of sales from number one product/service in 2006
Intensity of competition	Competition on the core market concerning frequency of new products' introduction, 1: very weak to 5: very fierce
Training intensity	Total expenditure for further training per employee in thousand € in 2005 (in log.)
Marketing intensity	Total marketing expenditure per employee in thousand € in 2006 (in log.)
Product life cycle duration	Average length of product life cycle for number 1 product/service (in years)
Physical capital intensity	Tangible assets in book value per employee in thousand € in 2006 (in log.)
Organizational innovation	Dummy variable (= 1, if the firm has introduced any organizational innovations during the years 2004-2006)
Industry	Set of 20 industry dummies (see Table 2.2 for grouping)

In step 1 we further control specifically for industry concentration, export intensity, credit rating, product/service diversification (reverse scaled), market share, intensity of competition and product life cycle duration. In both knowledge production functions we include the specific control variables training intensity, marketing intensity and product life cycle duration. Finally, we use physical capital intensity and organizational innovation as supplementary control variables in the productivity equation.

2.4. RESULTS

An overview of the average R&D intensity and the share of family SMEs in each industry class is provided in Table 2.2. The final sample of 2,087 companies contains 1,263 family SMEs (61% has $f_i=1$). We observe a wide distribution of family and non-family SMEs across all 20 industry groups. Family SMEs are more prevalent in industry classes with relatively low average innovation intensities such as food and tobacco than in sectors with relatively high average innovation intensities such as telecommunication.

TABLE 2.2
Industry Distribution of Firms

Industry	Nace codes	Total observations	Family SMEs		Percentage family SMEs	Mean innovation intensity
			No	Yes		
Food/tobacco	10-12	78	10	68	0.87	1.87
Textiles	13-15	76	20	56	0.74	2.40
Wood/paper	16-17	75	13	62	0.83	5.49
Chemicals	20-21	85	23	62	0.73	9.56
Rubber/plastics	22	83	20	63	0.76	3.18
Glas/ceramic goods	23	60	17	43	0.72	2.93
Metals	24-25	176	55	121	0.69	6.84
Machinery/equipment	28, 33	124	39	85	0.69	6.85
Electrical/optical equipment	26-27	168	55	113	0.67	13.17
Transport equipment	29-30	43	17	26	0.60	5.78
Furniture	31-32	61	18	43	0.70	6.23
Recycling	36-39	140	100	40	0.29	6.08
Energy/mining	5-9, 19, 35	112	65	47	0.42	3.46
Retailing/distribution	46	149	48	101	0.68	3.85
Transportation services	49-53, 79	169	62	107	0.63	1.10
Media services	18, 58-60	59	17	42	0.71	5.14
IT/telecommunication	61-63	87	58	29	0.33	24.02
Advertising	69-70, 73	99	60	39	0.39	3.02
Technical services	71-72	141	78	63	0.45	5.05
Consultancy	74, 78, 80-82	102	49	53	0.52	3.78
Total		2,087	824	1,263	0.61	6.07

Table 2.3 depicts the descriptive statistics for all variables that we use in this research. The information is split up into the *total sample* ($n = 2,087$) and the subsample of *innovators* including only firms with a positive innovation expenditure in 2006 ($n = 1,067$). Within our

total sample, the probability of investing in innovation in the year 2006 was 51%. Interestingly, we observe a higher share of family-owned firms in the subsample of *innovators* (65%) compared to the *total sample* (61%). Further, innovating firms are larger and slightly younger on average. Logically, the means of product innovation output and process innovation output are higher among *innovators* than among the *total sample*. Finally, we observe slightly higher levels of labor productivity among the subsample of *innovators*.

TABLE 2.3
Descriptive Statistics

Variable	Total sample <i>n</i> = 2,087		Innovators <i>n</i> = 1,067	
	Mean	SD	Mean	SD
Probability of investing in innovation	0.51	0.50	1.00	0.00
Innovation intensity	6.07	27.74	11.88	37.91
Product innovation output	17.06	45.07	32.86	58.48
Process innovation output	0.02	0.06	0.03	0.08
Labor productivity	186.02	326.51	187.35	324.08
Family SME	0.61	0.49	0.65	0.48
Firm size	64.10	58.69	71.94	62.95
East Germany	0.35	0.48	0.34	0.47
National group	0.16	0.36	0.17	0.38
International group	0.12	0.33	0.16	0.37
Firm age	30.83	33.59	29.62	33.84
Industry concentration	0.42	0.91	0.48	0.95
Export intensity	0.15	0.24	0.22	0.27
Human capital	0.17	0.23	0.22	0.25
Credit rating	2.30	0.55	2.26	0.54
Market share	23.20	29.73	22.24	26.17
Product/service diversification (inverse)	69.39	25.20	65.03	25.44
Intensity of competition	2.61	1.04	2.88	0.98
Training intensity	0.43	0.89	0.56	1.00
Marketing intensity	2.15	7.93	2.98	9.83
Product life cycle duration	16.01	25.32	14.11	21.14
Physical capital intensity	122.88	520.35	66.16	193.77
Organizational innovation	0.58	0.49	0.76	0.43

Notes : Non-log values are reported for all non-missing values.

Innovators are defined as firms with positive innovation expenditure in 2006.

Tables 2.4 to 2.6 report the estimation results from the econometric analyses. First, we discuss the results of the generalized Tobit model shown in Table 2.4. We find that family SMEs have a significantly higher propensity to invest in innovation than non-family SMEs ($p < .001$). Additional tests calculating marginal effects (not reported here) reveal that family SMEs have a 13 percentage points higher likelihood of investing in innovation than non-family SMEs.

The probability of investing in innovation is also positively associated with firm size, being part of a national group, industry concentration, export intensity, human capital, credit rating (reverse scaled), market share, product/service diversification (reverse scaled) and intensity of competition concerning the frequency of new products launches. Firm age relates negatively to the propensity to invest in innovation.

The results further suggest that conditional on investing in innovation, family SMEs do so less intensively than their non-family counterparts ($p < .10$). Next to family SMEs human capital and international group membership are positively related to innovation intensity, whereas firm size is negatively related.

TABLE 2.4
Generalized Tobit Regression Analysis for Innovation Intensity

Variables	Probability of investing in innovation		Innovation intensity	
Firm size	0.09 *	(0.04)	-0.26 ***	(0.06)
East Germany	-0.05	(0.07)	-0.04	(0.10)
National group	0.23 *	(0.09)	-0.14	(0.14)
International group	0.16	(0.11)	0.27 †	(0.14)
Firm age	-0.10 *	(0.04)	0.05	(0.07)
Industry concentration	0.15 ***	(0.04)	0.07	(0.06)
Export intensity	0.96 ***	(0.16)	0.34	(0.29)
Human capital	1.12 ***	(0.19)	1.32 ***	(0.35)
Credit rating	-0.10 †	(0.06)	-0.09	(0.09)
Market share	0.00 *	(0.00)	0.00	(0.00)
Product/service diversification (inv.)	-0.01 ***	(0.00)	0.00	(0.00)
Intensity of competition	0.27 ***	(0.03)	0.03	(0.09)
Product life cycle duration	0.00	(0.00)	0.00	(0.00)
Family SME	0.33 ***	(0.07)	-0.23 †	(0.14)
Constant	-0.52	(0.37)	1.89 **	(0.75)
Wald test ^a	732.11 ***			
Lambda			-0.73	(0.53)
Observations	2,087		1,067	

Notes: Industry dummies are included in the regression.

^a Wald test of independence of the selection and the innovation intensity equation.

† $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

A visual inspection of Table 2.5 reveals that whereas the coefficient for family SMEs is positively but not significantly related to product innovation output ($p > .10$), it is significant and positively associated with process innovation output ($p < .05$). Among the control variables, innovation intensity, firm size, East Germany, national group, marketing intensity and shorter product life cycles are positively related to product innovation output. Process innovation increases with firm size and training intensity but decreases with firm age.

TABLE 2.5
IV Tobit Regression Analyses for Innovation Outcomes

Variables	Product innovation output	Process innovation output
Innovation intensity	0.61 † (0.36)	0.00 (0.03)
Firm size	0.27 * (0.11)	0.02 * (0.01)
East Germany	0.28 † (0.16)	0.00 (0.02)
National group	0.35 † (0.21)	-0.02 (0.02)
International group	0.34 (0.22)	0.02 (0.02)
Firm age	0.12 (0.10)	-0.03 ** (0.01)
Human capital	0.00 (0.70)	-0.05 (0.07)
Training intensity	0.03 (0.04)	0.01 * (0.00)
Marketing intensity	0.06 ** (0.02)	0.00 (0.00)
Product life cycle duration	-0.01 * (0.01)	0.00 (0.00)
Family SME	0.25 (0.17)	0.03 * (0.02)
Constant	-0.19 (0.80)	-0.16 † (0.08)
Observations	1,067	1,067

Notes : Industry dummies are included in the regression.

† $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

As can be seen from the results in Table 2.6, family SMEs demonstrate a lower level of labor productivity than non-family SMEs ($p < .01$). In addition, product innovation, being part of a national or international group, firm age and physical capital intensity are positively associated with productivity. Firms located in East Germany and organizations that implemented an organizational innovation in contrast exhibit significantly lower levels of labor productivity. Finally, the effect of process innovation is positive but insignificant.

TABLE 2.6
IV Regression Analysis for Labor Productivity

Variables	Labor productivity
Product innovation output	0.17 *** (0.05)
Process innovation output	6.77 (4.59)
Firm size	0.04 (0.04)
East Germany	-0.36 *** (0.07)
National group	0.25 ** (0.09)
International group	0.22 * (0.11)
Firm age	0.13 * (0.06)
Human capital	-0.03 (0.19)
Physical capital intensity	0.03 ** (0.01)
Organizational innovation	-0.23 * (0.10)
Family SME	-0.21 ** (0.08)
Constant	4.18 *** (0.28)
Observations	1,067
R-squared	0.39

Notes : Industry dummies are included in the regression.

† $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

2.5. DISCUSSION

This exploratory analysis of differences between family and non-family SMEs across multiple interdependent stages of the innovation process remedies several shortcomings of prior research. It generates novel insights into how dominant families influence the propensity of SMEs to invest in innovation, their innovation intensity, their product and process innovation outcomes, as well as their labor productivity. A better comprehension of these relationships is necessary in view of the numerical importance of (family) SMEs and their extensive contributions to gross national products, job generation and technological innovation (Astrachan and Shanker, 1996; Klein, 2000; Roper, 1997; Zahra, 2005).

Our analysis reveals significant differences between family and non-family SMEs at each stage of the innovation process. First of all, our findings indicate that the innovation investment behavior is more complex and multifaceted in family SMEs than in large family businesses. On the one hand, family SMEs are more likely to invest in innovation than non-family SMEs in our sample. Among the innovating firms, on the other hand, they tend to invest less intensively. While the latter observation accords with previous results on large and public family enterprises (e.g., Block, 2012; Munari, Oriani and Sobrero, 2010), the literature so far was silent about the propensity to engage in innovation. Overall, our findings from the innovation investment stage draw a less negative picture about family firms. Innovation investments represent a double-edged sword, especially for small firms (Cefis and Marsili, 2006; Hannan and Freeman, 1984). While allocating funds to innovation significantly enhances a firm's likelihood of long-term survival (Esteve-Pérez and Mañez-Castillejo, 2008), intensive innovation investments also entail substantial risks (Latham and Braun, 2009). The benefits and risks of innovation endeavors are reflected in demographic studies of organizational populations that suggest a U-shaped relationship between the extent of firm innovation and mortality (e.g., Carroll and Hannan, 2000). It seems that the desire of family shareholders to build a lasting legacy for their offspring and to perpetuate socioemotional wealth (Gómez-Mejía et al., 2007) promotes the general willingness to allocate funds to innovation. The affinity to invest intensively into unproven and emerging technologies, however, is lower in family SMEs, probably because dominant families are reluctant to jeopardize their discretion (Classen et al., 2012) and their wealth by excessive risk taking during the innovation process (Zahra, 2005). Our results support the view that family SMEs try to maximize their likelihood of long-term survival by opting more often for a positive but less intensive innovation investment compared to non-family SMEs.

Concerning innovation outcomes, family SMEs are found to be at least equally effective in accomplishing product innovation and on average more effective than non-family SMEs in achieving process innovation. These findings suggest that German family SMEs in fact enjoy a competitive advantage regarding their ability to manage (process) innovation. They further support the notion that many German family SMEs have succeeded in extending their market leadership through continuous and gradual innovation (Simon, 2009). Studies based on the resource-based view suggest that family firms possess distinctive capabilities and resources (e.g., social capital configurations) that contribute to their innovation success (Eddleston, Kellermanns and Sarathy, 2008; Sirmon and Hitt, 2003). Family businesses tend

to establish close ties with selected stakeholder groups that can stimulate product and process innovation through the exchange of new ideas (Atuahene-Gima, 1996; Shipton et al., 2006). Family firms are further said to implement adoption decisions more quickly and with more stamina than non-family firms (König, Kammerlander and Enders, 2013). While these characteristics may contribute to the superior process innovation success in family SMEs, we encourage future research explaining how and why exactly this is the case.

Lastly, the lower level of labor productivity found in family SMEs controlling for innovation outputs is striking. It supports the argument that family interests are at times hard to align with purely economic considerations (Chrisman et al., 2012). Nepotistic behaviors toward other family members or a strong solidarity with non-family employees may serve the family at the cost of economic efficiency (Block, 2010; Cruz, Justo, and De Castro, 2012; Gómez-Mejía et al., 2011). It seems that the pursuit of family interests at the cost of higher productivity levels is more prevalent among SMEs, potentially because small firms are less subject to institutional pressures compared to large firms (Miller, Le Breton-Miller and Lester, 2013). It is important to note, however, that while the direct effect of family SME status on productivity is negative, indirect effects via product and process innovation outcomes might compensate.

Our research findings have important academic and practical implications. A more nuanced understanding of the innovation investment behavior in family firms is crucial for researchers and policy makers. Scholars need to account for the higher propensity of family firms to invest in innovation when analyzing the innovation intensity to avoid a selection bias. Simply looking at direct effects at one stage of the innovation process and neglecting potential indirect effects may also lead to simplified interpretations and biased policy implications. Hence, potential interdependencies between the different stages of the innovation process should not be ignored. For policy makers it is vital to discard the view of family firms as a form of business that fails to invest in innovation (Morck and Yeung, 2003). Instead, they may recognize the equally or even more successful innovation strategies of family SMEs with a higher emphasis on process than product innovation. Our results confirm the valuable contribution of family SMEs to innovation in the German SME sector. Future studies may inspect to which extent these findings are specific to the German case.

This research is limited in some ways that suggest opportunities for future inquiries. First, while we have data for two consecutive years on many variables, innovation investments often require longer horizons to materialize. To minimize potential reverse causality issues, we use lagged independent variables for several potentially endogenous regressors such as firm size, human capital or export intensity. We further use the predicted values of innovation intensity and product/process innovation outcome as instruments to account for a potential simultaneity bias. Nevertheless, a longitudinal study may shed additional light on the causal link of the investigated relationships.

A second limitation is our lack of information about the family involvement within the management team or the board of directors of the firms, which would allow for a more fine-grained analysis of family involvement effects. However, it is feasible to assume that family business managers - whether family member or not - will incorporate the owning family's interests in their decision (Habbershon, Williams and MacMillan, 2003). The utility function

of external managers in family businesses is to a large extent determined by a manager's relationship with the owning family who is responsible for the appointment, salary, promotion or layoff decisions. Family business owners are said to favor candidates who share the family values and fit in with the family's expectations (Cruz et al., 2012; Gómez-Mejía et al., 2011). Compensation and appraisal programs further reflect non-economic criteria such as fulfilling family obligations, contributing to the harmony of the family or supporting the family's agenda in judging performance (Beehr, Drexler and Faulkner, 1997). Yet, additional information about precise family or founder involvement may further enhance our understanding of innovation in family enterprises (Block, 2012; Kellermanns et al., 2012).

2.6. CONCLUSION

Our empirical research offers valuable new insights for research on innovation in family firms. In particular, this large-scale study sheds light on differences between family and non-family SMEs across multiple stages of the innovation process. While family SMEs have a higher likelihood to invest in innovation, these companies do so less intensively than their non-family counterparts. Family SMEs further achieve an at least equal level of product innovation output and a presumably superior level of cost savings from process innovation. Given the level of product and process innovation, however, family SMEs exhibit a lower labor productivity in comparison to non-family SMEs. These findings complement recent empirical research on R&D investments in large and publicly traded family firms.

3. R&D INVESTMENT IN FAMILY AND NON-FAMILY START-UPS: A BEHAVIORAL PERSPECTIVE¹¹

Abstract

The behavioral theory of the firm suggests that reference points influence the level of individual and organizational risk taking. In this study we propose that family start-ups and start-ups performing below aspiration have distinct reference foci which influence their level of research and development (R&D) investment intensity. Longitudinal data from the Kauffman Firm Survey (KFS) on 912 U.S. start-ups provides empirical evidence for our theoretical framework. We find that family start-ups in which at least two members of the same family own the majority stake invest less into the R&D of new products and services compared to non-family start-ups. Whereas performance below aspiration generally increases start-ups' subsequent R&D investment, this relationship is negatively moderated by family start-up status such that family start-ups increase their R&D expenditures to a lesser extent after performance below aspiration.

¹¹ This paper has previously been presented at the Babson Conference in Lyon 2013, the Ifera Conference in St. Gallen 2013, as well as at research seminars at Columbia Business School, KU Leuven, Rotterdam School of Management, Copenhagen Business School and the Bergamo Centre for Young Family Enterprises. We are thankful to the valuable support of the Kauffman Foundation throughout this project. In particular, we thank Alicia Robb and Joe Farhat for their support regarding the econometric analyses. Further, we would like to thank Alfonso Gambardella, Samuele Murtinu, Benjamin Campbell and another anonymous friendly reviewer for their insightful comments and suggestions on previous versions of this paper.

3.1. INTRODUCTION

Family firms contribute substantially to economies around the globe. Irrespective of the definition used, they also account for a substantial portion of businesses in the United States with a massive impact on the country's gross domestic product (Astrachan and Shanker, 2003). A considerable share of these firms already starts out as family firm with kinship ties between the founders (Brannon, Wiklund and Haynie, 2013; Chua, Chrisman and Sharma, 1999). Families derive a variety of emotional and social benefits from controlling a business and their loss aversion regarding such benefits is an important driver of strategic firm behavior (Gómez-Mejía et al., 2011). A growing amount of studies examining the research and development (R&D) investment of large and publicly traded firms have consistently reported lower R&D intensity levels in family than in non-family firms (Block, 2012; Chen and Hsu, 2009; Chrisman and Patel, 2012; Munari, Oriani and Sobrero, 2010; Muñoz-Bullón and Sanchez Bueno, 2011). In response to performance below aspiration levels however, large family firms tend to increase their R&D spending even more than non-family firms (Chrisman and Patel, 2012).

This research investigates whether family start-ups behave like established family enterprises regarding their investment in R&D and their response to declining performance. Addressing this previously unexplored question is relevant, because of the heterogeneity within the group of family firms (Chua et al., 2012) and different underlying mechanisms may motivate the investment choices of different types of family businesses (Lim, Lubatkin and Wiseman, 2010; Miller et al., 2011). In contrast to private family start-ups, publicly traded family firms are subject to strong institutional pressure, especially in situations of underperformance in which non-family shareholders might call for investment behavior that matches industry standards (Miller, Le Breton-Miller and Lester, 2013). Hence, the importance family firms place on performance vis-à-vis survival reference points is likely to change over their life cycle (March and Shapira, 1992; Miller and Chen, 2004). To examine the specific influence of controlling families on investment choices in start-up firms, our study compares the R&D investment intensity of family and non-family start-ups and the response of these start-ups to performance below aspiration levels.

We contribute to the literature by examining these relationships through the lens of the behavioral theory of the firm. The behavioral approach has guided much of the recent research on risk taking and R&D activities in large family and non-family firms (e.g., Chen, 2008; Chen and Miller, 2007; Chrisman and Patel, 2012; Greve, 2003). Despite a growing interest in family start-ups (Chua et al., 2011; Lumpkin, Steier and Wright, 2011; Sieger et al., 2011; Schjoedt et al., 2013) and behavioral theory applications to start-up firms (Bingham and Eisenhardt, 2011; Bingham, Eisenhardt and Furr, 2007; Dew et al., 2008; Gaba and Bhattacharya, 2012), to our knowledge no prior research has compared the investment decisions of family and non-family start-ups from a behavioral perspective. Applying the behavioral logic to the start-up context, we suggest that family start-ups exhibit a lower level of R&D investment intensity than non-family start-ups. We also propose that start-ups performing below aspiration levels will tend to increase their level of R&D spending. Finally,

we argue that family start-ups will increase their R&D expenditures to a lower extent than non-family startups after performance declines.

In order to test these predictions, we use panel data from the Kauffman Firm Survey on the R&D investment behavior of 912 US start-ups. The results from our analyses provide significant empirical support for our hypotheses. The following section provides a short introduction to the behavioral theory of the firm, as well as its previous applications to the start-up and the family business contexts. Based on this we will develop our hypotheses before we describe our data and methods. Finally, we will discuss our results and conclude.

3.2. THEORY AND HYPOTHESES

3.2.1. The Behavioral Theory of the Firm

The book of Cyert and March introduced the behavioral theory of the firm in 1963. By criticizing major assumptions of the previously dominating neo-classical school, it has strongly influenced the strategic management literature since then. According to the behavioral approach, decision makers neither permanently act as pure profit maximizers, nor do they always possess perfect knowledge about a situation. They rather base their strategic decisions on certain reference points such as performance aspirations to cope with uncertainty and bounded rationality (Kahneman and Tversky, 1979; March and Shapira, 1992; Miller and Chen, 2004). According to the strategic reference point theory, firms align their strategic behavior based on a set of situational variables such as their current performance relative to aspirations levels (Bowman, 1980; 1982). The basic assumption is that firms may be both, risk-averse and risk-seeking, depending upon whether decision-makers perceive themselves in the domain of gains and losses, respectively (Fiegenbaum, Hart and Schendel, 1996). Prior studies have provided compelling empirical evidence that risk preferences are not stable among individuals or firms but relative to such reference points (e.g., Bromiley, 1991; Singh, 1986; Wiseman and Bromiley, 1996).

Although the behavioral theory has originally been developed to explain strategic decisions in large organizations, recent research indicates its applicability to entrepreneurial and small enterprises (Dew et al., 2008; Dew et al., 2009; Gaba and Bhattacharya, 2012). In line with the behavioral view, the rationality of entrepreneurs is limited by the high degree of ambiguity characteristic of the start-up phase and the lack of organizational norms and resources that guide strategic decision-making in established organizations (Dew et al., 2008). Yet, the need to act quickly to utilize brief windows of opportunity requires them to accelerate their decision-making processes. Hence, entrepreneurs tend to favor the use of heuristics and reference points over time-consuming data collection and risk calculation when allocating resources (Busenitz, 1999; Dew et al., 2009; Hayward, Shepherd and Griffin, 2006; Shapira, 1995).

Previous research has also applied the behavioral theory to the family business setting (see Gómez-Mejía et al., 2011 for the most contemporary review). According to this stream of research, family businesses make extensive use of reference points in their resource allocation processes. Their primary reference point is the preservation of socioemotional benefits for the

family coming in various forms such as family control and influence, identification of family members with the firm, binding social ties, emotional attachment of family members or the opportunity to be altruistic to family members (Berrone, Cruz and Gómez-Mejía, 2012; Gómez-Mejía et al., 2007). Family principals' loss aversion with respect to these benefits causes differences between family and non-family firms regarding a variety of strategic domains like the level of domestic and international diversification (Gómez-Mejía, Makri and Larraza-Kintana, 2010), internal or external R&D activities (Chrisman and Patel, 2012; Classen et al., 2012), or corporate social responsibility (Berrone et al., 2010).

3.2.2. R&D Investment in Family Start-Ups

The behavioral theory proposes that family businesses have a tendency to pursue more risk averse investment strategies than non-family firms (Chrisman and Patel, 2012; Lim, Lubatkin and Wiseman, 2010; Wiseman and Gómez-Mejía, 1998). The focus on the socioemotional endowment of the owning family creates aspirations of security and stability that guide the strategic orientation of family firms (Gómez-Mejía et al., 2011). Due to these distinct goals, family firms are more inclined to follow conservative strategies compared to non-family firms or lone founder firms which favor more growth-oriented strategies (Block, 2012; Miller, Le Breton-Miller and Lester, 2011; Stanley, 2010).

Investments in R&D significantly affect the distribution of firm outcomes. Generally they are associated with an increase in long-term economic performance, but they also entail considerable risks that raise outcome variance (Chambers, Jennings and Thompson II, 2002; Chan, Lakonishok and Sougiannis, 2001). Once invested the bulk of expenses is irreversible (sunk cost) and future payoffs are very hard to predict given the uncertainties of R&D projects related to technical feasibility, as well as marketability (e.g., Pindyck, 1991; Shi, 2003). Given these characteristics of R&D investments, the behavioral theory predicts that family firms invest less intensively into R&D than non-family firms in order to preserve their socioemotional benefits (Chrisman and Patel, 2012). Numerous studies have provided empirical support for this prediction (Block, 2012; Chen and Hsu, 2009; Chrisman and Patel, 2012; Munari, Oriani and Sobrero, 2010; Muñoz-Bullón and Sanchez Bueno, 2011).

Similar to family principals in large firms, owners of family start-ups obtain a range of non-financial rewards such as social status or the sense of belonging to a tight social clan (Berrone, Cruz and Gómez-Mejía, 2012; Gómez-Mejía et al., 2011). As a consequence, family start-up failure not only implies financial, but also considerable non-financial sacrifices (Stanley, 2010). Damages to the family reputation and conflicts among family members (e.g., declining marital quality) are only two probable consequences that family principals will try to avoid by limiting the level of risk taking (Dyer and Whetten, 2006; Lim, Lubatkin and Wiseman, 2010). In view of significantly higher mortality rates during the start-up stage (liability of newness), the loss aversion with respect to socioemotional benefits will be no less widespread among family start-ups than among established family firms (Freeman, Carroll and Hannan, 1983; Stinchcombe, 1965). The loss aversion of owning families with respect to socioemotional benefits will hence also limit R&D investments in family start-ups. Therefore, we hypothesize:

Hypothesis 1: Family start-ups will invest less intensively into the R&D of new products and services than non-family start-ups.

3.2.3. Performance Below Aspiration and R&D Investment in Start-Ups

Discrepancies between actual firm performance and historical (past performance) or social (competitor performance) aspiration levels are among the most frequently investigated reference points. Ample empirical evidence suggests that performance below these reference points stimulates problemistic search and risk-taking in organizations (Bowman, 1980; 1982; Bromiley, 1991; Greve, 1998; Singh, 1986). In view of the well-established conception that R&D investments generally increase the mean and the variance of firm outcomes (Chambers, Jennings and Thompson II, 2002; Chan, Lakonishok and Sougiannis, 2001; Shi, 2003), managers will be more inclined to look for product and service innovations when they are dissatisfied with past results (Bolton, 1993). To find remedies to underperformance, they hence tend to raise their subsequent R&D expenditures. A variety of studies has confirmed the propensity of decision-makers to intensify R&D investments after organizational performance below aspiration (Chen, 2008; Chen and Miller, 2007; Chrisman and Patel, 2012; Greve, 2003).

Although research about this particular topic has focused on large and publicly traded firms, we know that decision-makers in start-up firms similarly rely on reference points and heuristics to make strategic choices (Busenitz, 1999; Dew et al., 2009; Hayward et al., 2006; Shapira, 1995). Given the absence of other comparative measures like analyst forecasts which serve as reference focus in many large and publicly traded firms (Gentry and Shen, 2013), historical and social performance levels appear even more useful in the start-up context. Further, entrepreneurs are less susceptible to the status quo bias and engage in more information-seeking behaviors with a motivation to change the status quo (Dyer, Gregersen and Christensen, 2008). The tendency to induce change is therefore even stronger among innovative entrepreneurs than among managers in established organizations. Start-ups performing below aspiration levels will therefore also engage in problemistic search and increased risk taking to close the difference between actual performance and aspirations. Hence, we posit that:

Hypothesis 2: Performance below aspiration levels will increase the subsequent R&D investment intensity of start-ups.

3.2.4. Response to Performance Below Aspiration in Family Start-Ups

The study of Audia and Greve (2006) has initiated the search for boundary conditions to the prediction of increased risk-taking as a response to performance below aspiration. According to the authors, decision-makers tend to refrain from increased risk taking, when they view low performance as a step closer to failure. This perspective builds on the idea that a perceived

threat to survival affects the level of individual and organizational risk taking in a different way than the traditional aspiration level considerations (March and Shapira, 1992). Stated specifically, firms viewing the threat to survival as primary reference point behave more risk avoiding than those using performance aspirations as a reference point (Staw, Sandelands and Dutton, 1981).

The research of Vissa, Greve and Chen (2010) suggests that problemistic search as a response to underperformance depends on the organizational form. In line with this, the study of Chrisman and Patel (2012) shows that family and non-family firms adjust their level of R&D investments differently when performing below aspiration. Based on a sample of 964 publicly held family and non-family firms from the Standard & Poor's 1500, the authors observe a positive moderation effect of family ownership on the relationship between performance below aspiration and R&D investments. They reason that in case family firms fall short on performance, they tend to behave more like non-family firms (which are generally found to invest more in R&D).

While publicly traded family firms may increase their risk taking even more than non-family firms in response to performance declines, this is unlikely in the start-up context. Loss averse family principals will have a higher awareness for potential threats to survival in the start-up phase, especially in situations of performance below aspiration levels. The focus on survival rather than performance in family start-ups will hence lead to lower risk taking in response to performance declines (March and Shapira, 1992; Miller and Chen, 2004). In addition, family start-ups face less institutional pressure to conform to industry standards than large and publicly traded family firms (Miller, Le Breton-Miller and Lester, 2013). While the latter group is rigorously overseen and controlled by external stakeholders who continually request justifications for and remedies against underperformance, privately held family start-ups are much less in the public eye. As a result, they enjoy greater discretion to follow the family agenda of preserving socioemotional benefits for the family. The pressure to close the gap between actual and aspired performance (e.g., by adjusting R&D investments to industry averages) is hence lower in family start-ups, also because capital providers in family firms are generally less concerned with the achievement of financial goals or benchmarks (Sirmon and Hitt, 2003). The previously hypothesized connection between performance decline and investments in innovation may thus hold to a lesser extent in family start-ups:

Hypothesis 3: Family start-up status will negatively moderate the relationship between performance below aspiration and R&D investment such that family start-ups will increase their R&D investments to a lower extent than non-family start-ups after performance below aspiration levels.

Our research model is summarized in Figure 3.1.

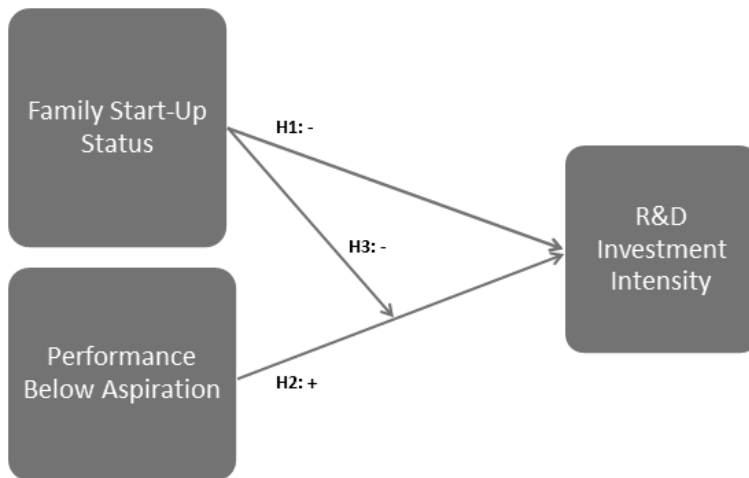


Figure 3.1: Research Model of Chapter 3

3.3. METHODOLOGY

3.3.1. Sample

This study uses data from the Kauffman Firm Survey (KFS), the largest longitudinal study of start-up firms ever embarked upon worldwide. It comprises data on start-ups founded in the US in 2004¹². Interviews were conducted with 4,928 firms in the baseline year 2004 either via the web or through computer-assisted telephone interviewing (CATI). These firms were then contacted again for each of the six annual follow-up surveys¹³. The KFS used a simple stratified sampling design that oversampled firms based on the R&D employment intensity in the firms' primary industries which makes it particularly useful for our research. To take this into account, all estimates in this study are calculated using longitudinal sample weights provided by the Kauffman Firm Survey (KFS). These weights not only allow us to draw inferences about the entire population of start-ups founded in the year 2004 in the US, they also prevent a potential survivorship bias that may arise from only considering firms that have survived until the year 2009.

We use a subset of the confidential KFS dataset in our empirical analysis. Given that the formation of a subpopulation is unrelated to the sampling design, the subpopulation sample size is a random variable. To take the randomness in the subpopulation sample size into account, we employ subpopulation analyses which make use of the entire dataset

¹² To be eligible as start-up for the KFS, at least one of the following five activities had to have been performed in 2004 and none performed in a prior year: 1) Payment of state unemployment (UI) taxes, 2) Payment of Federal Insurance Contributions Act (FICA) taxes, 3) Presence of a legal status for the business, 4) Use of an Employer Identification Number (EIN), 5) Use of Schedule C to report business income on a personal tax return.

¹³ Detailed information about the Kauffman firm survey can be found on the following website: <http://www.kauffman.org/kfs/About-the-KFS.aspx>

(Cochran, 1977; Kish, 1987; Lohr, 2010)¹⁴. Our subpopulation contains all start-ups that fulfill the following criteria. First, they have responded in each year from 2006 until 2009. Second, they possess at least a minimum (non-zero) amount of assets and employees (counting employed owners). Third, they are active in an industry with minimum (non-zero) average R&D investments. Finally, they have no missing values for any of the used variables and they have consistent ownership data¹⁵. Compared to the entire dataset consisting of 4,928 start-ups, our final subpopulation sample size is 912.

The question about the family start-up status is only included in the 2008 survey wave which confines the use of (fixed-effects) panel estimations. In order to mitigate potential concerns regarding reverse causality, we draw our dependent variable from the years 2008 and 2009 and on our independent variables from 2006, 2007 and 2008. The following section provides a detailed overview of the variables used in our analysis.

3.3.2. Measures and Analysis

In this study we use *R&D investment intensity* as our dependent variable. It refers to the degree to which a firm devotes its financial resources to R&D given its stock of resources, e.g., its employees (e.g., Barry, 2005; Hill and Snell, 1988). In line with this, we measure R&D investment intensity as the average estimated total R&D expenses per employee (including employed owners) for the years 2008 and 2009 scaled by 10,000¹⁶. By definition, this variable is left-censored at zero and it comprises all R&D related expenses for materials, equipment, rent, salaries and consulting fees.

Consistent with the question available in the Kauffman Firm Survey (KFS), we define a *family start-up* as a firm in which two or more members of the same family (including spouses, parents, guardians, children, siblings, or close relatives) own more than 50 percent of the company's shares in calendar year 2008. A dummy variable is created being equal to one, if the firm is a family start-up and zero otherwise. Most entrepreneurship and family business scholars have previously neglected the role of multiple (family) related start-up owners and the implications for strategic firm behavior. Despite the sizeable proportion of new businesses founded by two or more related individuals (Chua, Chrisman and Sharma, 1999; Schjoedt et al., 2013), the literature seems to presume that family firms are 'made rather than born' in the sense that they start out with a lone founder in complete control before family members may join the firm to construct a family business (Gómez-Mejía et al., 2011). Our definition of a family start-up generates new insight on this previously neglected type of firm. Yet, it is still in line with the wide-spread notion that the family must be the dominant coalition within the firm which usually implies that a single family owns the majority of shares and has

¹⁴ Longitudinal weights do not allow the exclusion of individual observations. To correctly calculate the variance of an estimate for a subpopulation, we need to incorporate the entire population in the analysis. The implications of ignoring the randomness in the subpopulation sample size will lead to underestimated standard errors.

¹⁵ To be considered as consistent, the sum of ownership shares needs to add up to 100% in calendar year 2007.

¹⁶ To ensure the robustness of our findings, we conducted additional tests using alternative proxies. Specifically, we also measured R&D investment intensity by the average R&D expenses in 2008 and 2009 relative to assets and relative to sales in the respective year. Both specifications yield qualitatively consistent results.

considerable authority over corporate decision-making (Chrisman, Chua and Sharma, 2005; Chua, Chrisman and Sharma, 1999).

We compare the group of family start-ups with two other start-up types: *Single owner start-ups* and *non-family start-ups*. In single owner start-ups one individual holds 100% of the shares and in non-family start-ups at least two unrelated owners own the majority of shares. The latter group serves as the reference group (excluded base category). Distinguishing between these two groups is essential, because they differ in central behavioral aspects of decision-making (Belenzon and Zarutskie, 2012). Contrary to a comparison between family start-ups and the remainder of start-ups, it allows for the sensible interpretation of effects related to the familial relationship between different owners.

The proxies for start-up performance relative to aspiration levels are based on prior related research (e.g., Chen, 2008; Chrisman and Patel, 2012). Specifically, we compute the difference between a firm's profit in year $t-1$ vis-à-vis the profit in year $t-2$ ¹⁷. In order to facilitate the interpretation of positive or negative deviation effects on R&D investment, we construct two continuous variables censored at zero. For the *performance below aspiration* we use the absolute value of the difference, if it is negative and zero otherwise. Similarly, the measure of the *performance above aspiration* is a censored continuous variable where the absolute value of the difference is used if it is positive and the variable is coded as zero otherwise.

The selection of control variables is consistent with previous related studies and also the coding of these variables follows prior research using the KFS (e.g., Coleman and Robb, 2009; Robb and Watson, 2012). To control for primary owner characteristics, we designate the primary owner for firms with multiple owners by the largest equity share in the year 2008.

In cases where two or more owners owned equal shares, hours worked were used to create a rank ordering of owners in order to define a primary owner. The complete list of variables including definitions is summarized in Table 3.1. To test our hypotheses we use Tobit regressions which take into account the censored nature of the dependent variable.

¹⁷ As a robustness check, we also test the effect of start-up performance relative to competitor performance on R&D intensity. We measure it as the profit in period $t-1$ vis-à-vis the median profit of firms in the relevant four-digit NAICS industry in year $t-2$. Like in the original measure, we construct two censored continuous variables. We observe qualitatively similar results using these proxies for performance relative to aspiration levels.

TABLE 3.1
Description of Variables

	Definition
Dependent variable	
R&D investment intensity	Average R&D expenses per employee in calendar years 2008 and 2009 (materials/equipment/rent/salaries/consulting fees; scaled by 10,000)
Independent variables	
Single owner start-up	Dummy=1, if one owner owned 100% of the company shares in calendar year 2008
Family start-up	Dummy=1, if 2 or more members of the same family owned > 50 % of the firm shares in calendar year 2008
Performance above aspiration	(Profit amount 2007- <i>Profit</i> amount 2006); if positive, absolute value in million Dollars, negative values censored at (0)
Performance below aspiration	(Profit amount 2007- <i>Profit</i> amount 2006); if negative, absolute value in million Dollars, positive values censored at (0)
Control variables: Firm/industry	
Total assets	Logarithm of estimated Dollar-value of total firm assets at the end of calendar year 2007
Product provided	Dummy=1, if company provided any product in calendar year 2007
Medium-tech industry	Dummy=1, if company was active in a medium-tech industry in calendar year 2008
High-tech industry	Dummy=1, if company was active in a high-tech industry in calendar year 2008
Industry code	Dummies: NAICS code in 2008=11,21-23(1); 31-33(2), 42-45(3), 47-49(4), 51-53(5), 54,55,61(6), 56,62(7), 71-72(8), 81,92(9)
IP possession	Dummy=1, if the company possessed any form of IP (patents, copyrights or trademarks) at the end of calendar year 2007
Competitive advantage	Dummy=1, if company perceived it had any competitive advantage in calendar year 2007
Number of business locations	Number of locations of the firm at the end of calendar year 2007
Training of workers	Dummy=1, if company provided any training to their employees in calendar year 2008
Total business debt	Total business debt at end of calendar year 2007 (credit cards, credit lines, bank and non-bank loans; increasing ordinal scale: 0-9)
Cash flow	(Cash assets on hand in accounts, certificates of deposit or other time deposits)/Total assets at the end of calendar year 2007
Economic crisis some influence	Dummy=1, if the firm perceived some (but not a strong) effect of the economic crisis on their business during calendar year 2008
Economic crisis strong influence	Dummy=1, if the firm perceived a strong effect of the economic crisis on their business during calendar year 2008
Control variables: Primary owner/respondent	
Primary owner: Female	Dummy=1, if the primary owner is female
Primary owner: Age	Age of the primary owner at his/her next birthday
Primary owner: High school degree	Dummy=1, if the primary owner has a high school diploma (but not higher)
Primary owner: Master's/doctorate degree	Dummy=1, if the primary owner has a Master's degree or doctorate
Primary owner: Working hours	Number of hours the primary owner works during an average working week in calendar year 2007
Primary owner: Industry work experience	Number of years the primary owner had previously worked in the industry in which the start-up competes
Primary owner: Entrepreneurial experience	Number of other firms founded by the primary owner besides this start-up
Primary owner: Minority	Dummy=1, if the primary owner belongs to any minority group
Responding owner: Net wealth (worth)	Approximate total net worth of the responding owner (assets incl. equity in home and business minus all debts; increasing ordinal scale: 1-5)

3.4. RESULTS

Table 3.2 provides descriptive statistics for all start-ups included in our subpopulation, as well as for each of the three different start-up types separately. We observe that 14.1% of the start-ups in our subpopulation are family start-ups, 65.5% are single owner start-ups and the remaining 20.4% are non-family start-ups. While the average start-up within the subpopulation annually invests about 1,020 dollars per employee in R&D, we observe large differences across the three start-up groups. Family start-ups and single owner start-ups invest less than half the Dollar-amount per employee into R&D compared to non-family start-ups.

TABLE 3.2
Mean Comparisons Across Start-Up Types

	All Start-Ups	Non-Family Start-Ups	Family Start-Ups	Single Owner Start-Ups
Dependent variable				
R&D investment intensity	0.102	0.203	0.087	0.073
Independent variables				
Single owner start-up	0.655	0	0	1
Family start-up	0.141	0	1	0
Performance above aspiration	0.142	0.334	0.030	0.107
Performance below aspiration	0.042	0.052	0.037	0.040
Control variables: Firm/industry				
Total assets	11.037	11.943	11.940	10.560
Product provided	0.472	0.498	0.529	0.451
Medium-tech industry	0.150	0.124	0.145	0.159
High-tech industry	0.022	0.031	0.029	0.017
IP possession	0.207	0.263	0.283	0.173
Competitive advantage	0.647	0.649	0.678	0.640
Number of business locations	1.152	1.223	1.168	1.127
Training of workers	0.285	0.375	0.285	0.257
Total business debt	2.032	2.490	2.515	1.785
Cash flow	0.229	0.210	0.190	0.244
Economic crisis some influence	0.430	0.435	0.404	0.434
Economic crisis strong influence	0.385	0.316	0.449	0.392
Control variables: Primary owner (PO)/respondent				
Primary owner: Female	0.273	0.234	0.354	0.267
Primary owner: Age	48.186	48.618	48.761	47.927
Primary owner: High school degree	0.405	0.391	0.390	0.413
Primary owner: Master's/doctorate degree	0.198	0.160	0.240	0.201
Primary owner: Working hours	46.358	46.293	46.512	46.345
Primary owner: Industry work experience	13.631	14.470	11.755	13.775
Primary owner: Entrepreneurial experience	1.043	1.203	1.124	0.975
Primary owner: Minority	0.204	0.153	0.199	0.221
Responding owner: Net wealth (worth)	3.861	4.094	4.245	3.706
Number of supopulation observations	912	185	134	593
Total number of observations	4,928			

Table 3.3 reports the results from the Tobit estimations used to test our hypotheses. Model 1 is the baseline model including only the control variables. It shows a number of noteworthy relationships between the controls and the level of start-up R&D investment intensity. Regarding industry and firm variables, we observe that start-ups that are larger, that are active in a medium or high-tech industry, that possess any form of IP or competitive advantage, that have higher levels of cash flow or business debt, as well as those strongly influenced by the economic crisis exhibit higher levels of R&D intensity. Considering primary and responding owner characteristics, R&D intensity relates positively to owners who are younger, work longer hours, have more entrepreneurial experience and have a higher net wealth.

TABLE 3.3
Tobit Regression Analyses for R&D Investment Intensity*

Dependent variable: R&D investment intensity	Model 1		Model 2 (H1+H2)		Model 3 (H3)	
	Coeff	SE	Coeff	SE	Coeff	SE
Total assets	0.070 †	0.042	0.042	0.039	0.043	0.040
Product provided	0.151	0.147	0.150	0.147	0.160	0.147
Medium-tech industry	0.365 *	0.176	0.351 *	0.175	0.353 *	0.173
High-tech industry	0.513 *	0.236	0.559 *	0.226	0.570 *	0.226
IP possession	0.672 ***	0.148	0.646 ***	0.146	0.654 ***	0.147
Competitive advantage	0.246 *	0.124	0.261 *	0.124	0.258 *	0.125
Number of business locations	-0.005	0.065	-0.025	0.074	-0.026	0.074
Training of workers	0.167	0.117	0.126	0.120	0.133	0.119
Total business debt	0.042 *	0.021	0.038 †	0.021	0.038 †	0.021
Cash flow	0.462 †	0.241	0.410 †	0.237	0.419 †	0.238
Economic crisis some influence	0.138	0.157	0.172	0.155	0.178	0.154
Economic crisis strong influence	0.415 *	0.173	0.477 **	0.174	0.491 **	0.174
Primary owner: Female	0.115	0.163	0.123	0.169	0.119	0.169
Primary owner: Age	-0.022 **	0.007	-0.023 ***	0.007	-0.023 ***	0.007
Primary owner: High school degree	-0.178	0.151	-0.141	0.150	-0.137	0.151
Primary owner: Master's/doctorate degree	0.006	0.170	0.055	0.170	0.044	0.171
Primary owner: Working hours	0.007 *	0.004	0.008 *	0.003	0.008 *	0.003
Primary owner: Industry work experience	0.001	0.006	-0.001	0.006	0.000	0.006
Primary owner: Entrepreneurial experience	0.080 *	0.040	0.081 *	0.040	0.081 *	0.040
Primary owner: Minority	0.054	0.137	0.065	0.139	0.080	0.139
Responding owner: Net wealth (worth)	0.108 †	0.064	0.112 †	0.065	0.110 †	0.065
Single owner start-up			-0.446 **	0.145	-0.444 **	0.145
Family start-up			-0.501 **	0.188	-0.432 *	0.197
Performance above aspiration			0.001	0.003	0.001	0.003
Performance below aspiration			0.197 **	0.066	0.209 ***	0.063
Family start-up*performance above aspiration					0.562	2.121
Family start-up*performance below aspiration					-2.621 *	1.127
Constant	-2.550 ***	0.644	-1.901 ***	0.618	-1.892 **	0.617
Number of supopulation observations		912		912		912
Total number of observations		4,928		4,928		4,928
Sigma	1.116 ***	0.152	1.099 ***	0.152	1.097 ***	0.151
Prob > F	0.000		0.000		0.000	

† $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

*Industry dummies are included in all regressions

Model 2 contains the same set of control variables complemented by our variables of interest. The results indicate support for Hypothesis 1 predicting that family start-ups invest less intensively into R&D than non-family start-ups ($p = .008$). Notably, single owner start-ups equally invest less intensively into R&D than non-family start-ups.

Hypothesis 2 posits that performance below aspiration levels will increase the subsequent level of R&D investment in start-up firms. A visual inspection of Model 2 in Table 3.3 reveals that the results also provide support for this hypothesis ($p = .003$). Performance above aspiration has no effect.

Finally, Model 3 contains all variables included in Model 2 plus the interaction terms between family start-up status and performance relative to aspiration to test our last Hypothesis 3. We anticipated a negative moderation effect of family start-up status on the relation between performance below aspiration and R&D intensity. We also find significant support for this hypothesis ($p = .020$)¹⁸.

3.5. ADDITIONAL ANALYSES AND ROBUSTNESS CHECKS

We conducted various additional analyses to validate the robustness of our findings¹⁹. First, we considered the possibility that R&D investment intensity is endogenous to family start-up status. In other words, factors that might affect R&D investments over time could also affect the desirability of continuing family ownership. To check for a potential endogeneity bias concerning the relationships predicted in Hypotheses 1 and 3 (i.e. the disposition of family start-ups to finance R&D investments by means of selling ownership stakes), we ran supplementary regressions in which our subsample only comprises start-ups in which the aggregate ownership change was lower than 5% since the foundation in 2004 ($n = 687$). This significantly limits the cases in which the start-up status may have changed since 2004. Again these regressions provide similar results and both hypothesized relationships remain significant in the predicted direction. This suggests that our findings are not biased by potential endogeneity effects.

Second, we checked whether the presence of other ownership types such as venture capitalists or business angels affects the observed relationship between start-up status and R&D investment intensity. In order to test this, we ran supplementary regressions in which we additionally control for whether the firm obtained any external equity financing from venture capitalists, business angels, other companies, the government or any other sources. Our hypothesized effects remain equally significant including this extra control variable.

Finally, the accounting measure we use to proxy performance below aspirations might potentially be subject to conceptual disadvantages arising from accounting conventions. To ensure the robustness of our findings for Hypotheses 2 and 3, we hence executed further regression analyses in which we proxy performance relative to aspiration levels by means of a perceptual measure instead. In 2008 the KFS includes a question how much the business met

¹⁸ Additionally including the interaction terms of the single owner start-up status and performance below and above aspiration does not alter our findings. The added interaction terms themselves are not significant.

¹⁹ The results of these additional tests are not reported here for brevity but they are available from the first author upon request.

the respondent's expectations for growth since its foundation. The three mutually exclusive answer categories are 'exceeded', 'met' or 'did not meet expectations'. We generate a dummy variable *performance below aspiration* taking the value one, if firms indicated the third category and an interaction term with family start-up status to replace the originally used measures in our regressions. We also find significant support for our hypotheses with this alternative measure.

3.6. DISCUSSION AND CONCLUSION

This study has illustrated how family start-up status and performance below aspiration influence the level of R&D investment intensity in start-up firms. For this purpose, we considered panel survey data on the R&D investment behavior of U.S. start-up firms founded in 2004. The results support our predictions drawing from the behavioral theory of the firm.

Our research provides several new insights. First, we find that family start-ups invest less into the R&D of new products and services compared to non-family start-ups. The tendency of family firms to invest less in R&D is well documented for large and established family firms (Block, 2012; Chrisman and Patel, 2012; Munari, Oriani and Sobrero, 2010). Our study extends this stream of empirical research by showing that family ties between owners already limit the R&D investment intensity of start-ups firms. Interestingly, we also observe significantly lower R&D investment intensities in single owner start-ups compared to non-family start-ups. This offers preliminary empirical evidence suggesting that single controlling owners and family owners share certain behavioral characteristics that give rise to similarly risk-averse conduct (Lim, Lubatkin and Wiseman, 2010).

Second, we observe that start-up performance below aspiration is related to higher subsequent levels of R&D investment in support of our second hypothesis. Also this finding accords with prior studies based on large and publicly traded companies (Bromiley, 1991; Greve, 1998; 2003; Bolton, 1993). It appears that decision-makers in start-up firms rely on comparable heuristics as those in established companies when deciding upon the level of R&D investment. In particular, historical and social performance aspiration levels seem to equally serve as reference points influencing risk preferences of start-up firms. Together with the first finding this provides new empirical support for the suitability of the behavioral theory to the start-up context (Dew et al., 2008; Gaba and Bhattacharya, 2012).

Finally, considering the uncertainties that R&D investments introduce to start-up firms, we tested how the extent to which founders increase risk taking as a response to performance below aspiration may vary across different start-up types. The results support our argument that family principals tend to perceive underperformance rather as a threat to survival than as an inducement to increase risk taking. This finding opposes the results of the study of Chrisman and Patel (2012) who find a positive moderation effect of family ownership on the relationship between performance below aspiration and R&D investment in large and publicly traded firms. We explain this discrepancy in the light of the significantly higher likelihood of failure during the start-up phase which seemingly reinforces the risk aversion of family start-ups (Freeman, Carroll and Hannan, 1983; Stinchcombe, 1965). In contrast to family firms from the S&P 1500, the reference point of survival appears to outrank

performance aspirations in family start-ups. As a result, underperforming family start-ups are unlikely to accept increased outcome uncertainties associated with higher levels of R&D intensity.

While our findings suit traditional risk aversion arguments from the family firm variant of the behavioral theory (Lim, Lubatkin and Wiseman, 2010), alternative mechanisms might be at play that explain our results. It could potentially be that family start-ups are more inert owing to constraints from internal politics, commitment to failing courses of action or perceptual biases (Greve, 2003). Like risk aversion, managerial inertia can inhibit problemistic search and R&D intensification after performance declines. Family firms have previously been associated with problems related to inertia and resistance to change, as well as their inclination to care less about market dynamics (e.g., Aronoff et al., 1997). A strong motive for this attitude is the family's desire to maintain control and discretion over the innovation process which limits forms of problemistic search that may interfere with this objective (Classen et al., 2012).

Another alternative explanation for our findings could be that the level of conceptual slack is lower in single owner and family start-ups than in non-family start-ups. Conceptual slack refers to the divergence in analytical perspectives among members of an organization pertaining to its technology or production processes (Schulman, 1993). Higher levels of conceptual slack and diversity in executive teams have generally been associated with higher levels of innovation (Bantel and Jackson, 1989). Almost by definition, entrepreneurial teams will have higher conceptual slack than single owner start-ups. Further, the level of divergence in analytical perspectives is likely to be lower in family start-ups in which members of the ownership team are primarily drawn from the nuclear family where ties, trust and identification with each other are strongest. Compared to such highly homogeneous FET-teams, non-FET will hence possess more conceptual slack and diversity which will cause more intensive search for innovation (Classen et al., 2012).

This study has several limitations which at the same time provide interesting opportunities for future research. First, the KFS comprises limited information on the specific family involvement within the start-up. Future studies may disentangle the specific effects of particular types of family relations between owners (e.g., father-daughter, brother-sister relations) on start-up R&D intensity. Additional work is also necessary to investigate how changes in family ownership increase or decrease subsequent R&D investment of start-up firms over time. While we are able to demonstrate that our results are not driven by potential endogeneity effects, we are still cautious with causal interpretations of our findings. Second, our sample is restricted to firms founded in the US in the year 2004. While this facilitates the comparability within our sample, it may also limit the generalizability of our results to other contexts. Future research may look at the investigated relationships across different settings to assess the external validity of our findings.

In spite of the above limitations, our study has relevant implications for decision-makers in family start-ups and policy-making. Investments in R&D support the accumulation of organizational capacity to learn and absorb new things over time (Cohen and Levinthal, 1990). Firms that invest intensively in R&D may hence develop a strong capacity to value, assimilate, or apply new information (Lane and Lubatkin, 1998; Tsai, 2001). Less intensive

R&D investments in family start-ups on the contrary, might cause a disadvantage for these firms regarding their ability to use externally located resources in the long-run (Classen et al., 2012). An awareness of this propensity might enable managers to develop counter strategies improving the absorptive capacity of young family firms.

In a similar vein, policy makers may benefit from a better understanding of risk preferences in different types of start-up. Whereas innovative new ventures are often viewed as an important driver of economic growth in capitalist economies (Baumol, 2002), the entrepreneurship literature emphasizes that many start-up firms innovate very little or not at all (Shane, 2008). It seems that the extent to which founders are willing to bear the risks associated with R&D endeavors varies considerably (Kihlstrom and Laffont, 1979) and our knowledge about the factors that hamper or support innovation activities in start-ups is scarce. To this end, our study has shed some new light on how family start-up status and performance below aspiration affect the level of R&D investment in start-up firms.

4. ACCESSING RESOURCES FROM INNOVATION PARTNERS: THE SEARCH BREADTH OF FAMILY SMES²⁰

Abstract

This study investigates differences in the diversity of cooperation partners used for innovation-related activities (i.e., search breadth) between family and non-family small and medium-sized enterprises (SMEs), as well as within the group of family SMEs. The results generally confirm our hypotheses derived from the behavioral theory of the firm. Specifically, we show that family SMEs have a lower search breadth than their non-family counterparts. Our findings further illustrate how attributes of the CEO (level of education) and the top management team (non-family management involvement and educational background diversity) relate to the search breadth of family SMEs.

²⁰ This chapter is based on the following article: Classen, N., Van Gils, A., Bammens, Y., and Carree, M. (2012). Accessing resources from innovation partners: The search breadth of family SMEs. *Journal of Small Business Management*, 50(2), 191-215. An earlier version was also published in the Academy of Management Best Paper Proceedings in 2011. Prior versions of this paper were presented at the Academy of Management conference, 2011, the Inscope conference, 2011, and the EIASM Workshop on Family Firms Management Research, 2010.

4.1. INTRODUCTION

Entrepreneurship and innovation are fundamental drivers of economic growth and wealth creation in our economy and of a firm's long-term survival, profitability and growth (Acs and Armington, 2004; Bruyat and Julien, 2000). In order to foster their innovativeness, businesses increasingly engage in cooperative agreements with a wide range of partners to access external resources. From a strategic resource-based perspective (Das and Teng, 2000; Eisenhardt and Schoonhoven, 1996), these partnerships are developed to create value by externally accessing and leveraging strategically critical resources to support the firm's innovation process. A considerable share of innovating firms establishes strategic R&D links with suppliers, customers, competitors and universities simultaneously (Tether, 2002). Previous research has shown that such a broad search for resources enhances the innovation success of companies in a variety of technological domains and geographic areas (Laursen and Salter, 2006; Leiponen and Helfat, 2010; Phelps, 2010). Therefore, this study focuses on the determinants of search breadth, which we define as the number of different external sources or partner types that firms rely upon to acquire resources for their innovative activities (Laursen and Salter, 2006).

Broader search horizons are of particular importance for innovation processes in small and medium-sized enterprises (SMEs) where knowledge and other resources are often limited (Street and Cameron, 2007). Hence, it is no surprise that the number of SMEs pursuing open innovation routes is growing despite organizational challenges that may arise from dealing with various external partners (Van de Vrande et al., 2009). Yet, to date, our knowledge of the antecedents of search breadth in general, and specifically among SMEs, remains underdeveloped. By comparing family and non-family SMEs, our study aims to clarify the role of family involvement as a determinant of the search breadth of SMEs. We furthermore investigate differences within the heterogeneous group of family SMEs and explore some options these firms might have to enhance their search breadth.

The prevalence and economic importance of family firms warrants further exploring to what extent family involvement influences search breadth. Indeed, in many firms, especially among SMEs, control over policymaking rests in the hands of a single family (Burkart, Panunzi and Shleifer, 2003; Daily and Dollinger, 1993). Though there is no agreed-upon operational criterion for the degree of family involvement (e.g., percentage ownership, senior management positions) required to qualify a firm as a family firm, most family business scholars agree that the family must be the dominant coalition within the firm with authority over corporate decision-making (Chrisman, Chua and Sharma, 2005; Chua, Chrisman and Sharma, 1999; Westhead and Cowling, 1998). This implies that ownership and typically also management are controlled by a single family providing the necessary authority to strategically direct the firm's decision-making (Chua, Chrisman and Sharma, 1999). In line with these conceptions of family control and authority, our definition of a family firm requires the majority of shares and the CEO position to be in the hand of a single family. Family business research is based on the premise that the consideration of family-oriented norms and aspirations (e.g., generational transfer, altruism, family identity) in decision-making will lead to distinct firm behaviors, making family firms theoretically different from their non-family

counterparts (Gómez-Mejía et al., 2007; Miller, Le Breton-Miller and Scholnick, 2008). Our study will clarify how this involvement of a dominant family coalition in SMEs influences search breadth or diversity in innovation partners.

Our theoretical development is based on the work of behavioral theory scholars (Bromiley, 1991; Cyert and March, 1963; March and Simon, 1958) indicating that behavioral factors like values and cognitive backgrounds of dominant coalitions within a firm influence complex strategic decisions (Hambrick and Mason, 1984; Olson, Parayitam and Bao, 2007). Scholars have also emphasized that the scope of search activities depends on internal variables such as aspiration and strategic intent (e.g., Nelson and Winter, 1982). In view of that, we posit that the values and cognitive backgrounds of key decision-makers within the firm influence the search breadth of family versus non-family SMEs. We claim that family businesses prefer a less diversified set of external partnerships within the innovation process, partly because of their focus on socioemotional wealth (SEW) preservation (Gómez-Mejía et al., 2007) and partly because of their limited cognitive diversity and absorptive capacity (Cohen and Levinthal, 1990; Hambrick and Mason, 1984). Further, acknowledging that not all family firms are alike, we argue that the level of CEO education, the percentage of non-family managers in the management team and the educational background diversity in the management team affect the search breadth of family SMEs.

This paper makes several important contributions to the literature. First, with prior research mostly focused on the outcomes of search breadth, our study extends knowledge on potential determinants of search breadth, in particular with regard to idiosyncratic search breadth preferences of different types of SMEs. Second, we illustrate how behavioral characteristics of decision-makers (i.e., value-based preferences and cognitive bases) may influence strategic innovation decisions and processes within SMEs. Third, this study contributes to the growing literature on innovation in family firms, which thus far concentrated primarily on internal aspects of the innovation process, such as R&D investments, while neglecting external cooperation. As such, our study offers additional insight into the innovation-related distinctiveness of family firms. Further, with prior work on family firms' external social capital mainly highlighting potential advantages of family control (e.g., Arregle et al., 2007; Salvato and Melin, 2008), our study suggests some boundary conditions to these benefits; specifically, our results suggest family firms may be disadvantaged when it comes to external ties that might challenge the family's discretion and cognitive capacity such as innovation partnerships. Lastly, this paper also sheds light on the determinants of search breadth variance within the group of family firms and identifies several options these firms might have for broadening their search horizon.

In the next section of the paper we discuss the theoretical background and present our hypotheses. Subsequently, we describe the sample used and the methodology applied. In the last section, we discuss the results of our analysis and conclude.

4.2. THEORETICAL BACKGROUND AND HYPOTHESES

Scholars have repeatedly highlighted the interactive character of the innovation process, suggesting that innovators rely heavily on their interaction with lead users, suppliers and a

range of institutions inside the innovation system (Brown and Eisenhardt, 1995; von Hippel, 1988). Arguing that searching broadly enriches companies' knowledge pool, enhances recombinatory search and adds complementary assets, Katila and Ahuja (2002) were the first to provide empirical support for a positive relationship between search scope (how widely a firm explores external knowledge) and product innovation. This link has subsequently been confirmed by other studies using the term search breadth instead of search scope (e.g., Leiponen and Helfat, 2010). Laursen and Salter (2006) observed a curvilinear effect of search breadth on product innovation, thereby indicating a potential "over-search" by firms. Search breadth has primarily served as a potential determinant of innovation outcomes in previous research. Therefore, very little is known about the antecedents of search breadth itself. Notable exceptions are the studies of Lampert and Semadeni (2010) indicating that the level of R&D expenditure is positively related to search breadth and of Grimpe and Sofka (2009) showing that innovation-related search patterns differ between low- and high-technology sectors.

Academic interest in the topics of open innovation and networks is also growing among SME researchers (e.g., Sungjoo et al., 2010; Van de Vrande et al., 2009), yet knowledge of antecedents of SMEs' search breadth remains largely undeveloped. Empirical evidence does reveal that SMEs are regular users of external information and other resources (Johnson and Kuehn, 1987), that these firms prefer links with customers and suppliers over relationships with competitors (Fann and Schmeltzer, 1989), and that the search effort is positively related to financial performance (Dollinger, 1984). As for the family business setting, previous innovation studies have mainly focused on internal innovation policies such as R&D investments (e.g., Block, 2012; Munari, Oriani and Sobrero, 2010). A notable exception is Zahra (2012), who explored the impact of family involvement on entrepreneurial activity via organizational learning. To our knowledge no prior study has dealt with the diversity of external innovation partners within the family firm context.

While the variety of innovation-related business links seems to stimulate innovation in general, prior research has shown that firms use different types of R&D partners for different purposes (Teece, 1980). Companies collaborating with customers primarily search for new ideas or ways to reduce uncertainty associated with market introduction of innovations (von Hippel, 1988). In contrast, partnerships with suppliers generally aim at input quality improvements or cost reductions from process innovations (Hagedoorn, 1993). Collaboration with competitors is typically motivated by potential synergy effects (Das and Teng, 2000) or sharing R&D costs (Miotti and Sachwald, 2003). Connections to public agencies are mainly established when firms seek funding for innovation projects. Finally, cooperation with universities and research institutes typically pursues radical breakthrough product innovations that may open up entire new markets or market segments (Monjon and Waelbroeck, 2003; Tether, 2002).

The strategic decision to cooperate with a diversity of external partners within the innovation process, and thus to search broadly or narrowly, is expected to depend on the behavioral characteristics of the main decision-makers in an organization. According to the behavioral theory of the firm - rooted in the writings of March and Simon (1958) and Cyert and March (1963) - complex strategic decisions are largely the outcome of behavioral factors

rather than of economic optimization. Preferences of decision-makers may change with the framing of problems depending on the context being faced (Bromiley, 1991) and the perceived threats to what they believe is important.

Applying this logic to family firms, Gómez-Mejía et al. (2007) suggest that family firms are primarily concerned with conserving the SEW that families derive from controlling their businesses. By SEW they refer to nonfinancial aspects like the ability to exercise personal control, clan membership, identity, the opportunity to be altruistic to family members and the perpetuation of the family dynasty. Along the lines of a behavioral agency model, these authors argue that when family firms face the quandary of choosing between an action that would confer economic gains (but a subsequent deficit of SEW) and the alternative of protecting SEW (but with uncertain economic benefits), they would tend to favor the latter. In other words, family firms often face a trade-off between family goals like family discretion (Schulze et al., 2001) and business goals such as an optimized resource acquisition process. Consequently, family values such as the emphasis on SEW may also have an impact on the strategic partnering behavior of a firm.

Furthermore, prior research suggests that if strategic choices have a behavioral component, they should, next to values, also reflect the cognitive background of decision-makers (Hambrick and Mason, 1984). Members of a dominant coalition bring in a set of “givens” to an administrative situation that reflects their cognitive background and shapes their perception and the interpretation of situations. It is composed of their knowledge about future events, alternatives and consequences attached to those alternatives (March and Simon, 1958). Previous research indicates that the diversity of these cognitive backgrounds significantly affects management team performance trajectories because these teams require cognitive diversity in order to deal with complex adaptive environments. It improves their ability to generate a wide range of alternative solutions and to process the complexities of the external environment (Milliken and Martins, 1996; Simons, Pelled and Smith, 1999). Further, cognitive diversity enhances a firm’s absorptive capacity - the capability to recognize the value of new, external information (Cohen and Levinthal, 1990; Zahra and George, 2002). These are necessary ingredients for a firm to effectively manage the complexity of a diverse partnership network. Higher levels of cognitive diversity and absorptive capacity should therefore increase a firm’s perceived benefits from search breadth. Taking a contingency-based perspective that allows for varied preferences and cognitions of dominant coalitions, we apply the behavioral theoretic model to predict search breadth differences between family and non-family SMEs in the following section.

4.2.1. Family versus Non-Family SMEs: Differences in Search Breadth

SMEs rarely possess all resources they require to innovate effectively. By sharing the accumulated resources located in a diverse network, SMEs can improve their innovation potential (Van de Vrande et al., 2009). In addition, businesses can reduce the uncertainty associated with innovation processes when they collaborate with customers, suppliers, competitors and other organizations. Nevertheless, SMEs differ in their capabilities and willingness to utilize externally located resources (Zhang, Macpherson and Jones, 2006). This

variance may be partly explained by differences in values, cognitive diversity and absorptive capacity of family and non-family SMEs.

In contrast to other firms, family businesses must find a balance between two overlapping systems: the family and the business. Each of the two systems has its own values and objectives that sometimes oppose each other (Distelberg and Sorenson, 2009; Gersick et al., 1997). Using a sample of 1,237 olive oil mills, the findings of Gómez-Mejía et al. (2007) show that family-owned businesses are more hesitant to join a cooperative, a strategic decision associated with economic gains but also with a loss of family control. The work of Gómez-Mejía, Makri and Larraza-Kintana (2010) further substantiates the view that family firms' reluctance to give up SEW may contradict with economic goals. In a sample of 360 family and non-family firms operating in all major industry groups, the authors provide empirical support for their claim that family firms on average diversify less both domestically and internationally than non-family firms though the overinvestment of family managers in the business would logically call for a higher degree of diversification. Similar to the strategic decisions examined by Gómez-Mejía et al. (2007) and Gómez-Mejía, Makri and Larraza-Kintana (2010), external cooperation with a variety of innovation partners sets limits to a family's autonomy in subsequent decision-making processes. In family firms where the family CEO often enjoys the discretion to make major decisions without undue interference from externals, this will lead to a perceived loss of freedom to act in the interest of the family. As a result, the SEW derivable from the business may drop because of the inclusion of external partners in the decision-making processes of a family firm. Thus, though family control might actually increase a firm's economic incentive to learn from its environment and exploit external opportunities (Zahra, 2012), we posit that family firms are likely to refrain from utilizing mechanisms, such as a broad portfolio of innovation partnerships, that detract from their SEW focus.

Another reason why family firms may search less broadly for external resources is their limited cognitive diversity and absorptive capacity compared with non-family firms (Daily and Dollinger, 1993; Fiegenger et al., 1996; Sirmon and Hitt, 2003), which lowers their ability to create innovations based on new and insightful connections among diverse sources (Zahra, 2012). Family SMEs often encounter limits to the quality and quantity of human capital because of their inability to recruit outside professional managers (Covin, 1994a; 1994b). Qualified managers may avoid family firms because of the exclusive succession, limited potential for professional growth, lack of perceived professionalism, and limitations on wealth transfer (Donnelley, 1964; Horton, 1986). As a result, family firms often obtain an undiversified set of cognitive resources and fail to unravel their potential absorptive capacity (Sirmon and Hitt, 2003; Zahra, 2012; Zahra and George, 2002). This, in turn, lowers family firms' receptiveness to a broad search process. Hence, we argue that because of their focus on maintaining SEW, as well as their limits in cognitive diversity and absorptive capacity, family SMEs tend to search less broadly for external resources than non-family SMEs.

H1: Family SMEs have a lower search breadth than non-family SMEs.

4.2.2. Family SMEs: Heterogeneity in Search Breadth

Family firms are a heterogeneous group controlled by decision-makers with varying degrees of socioemotional attachment to the firm and different cognitive backgrounds (Westhead and Howorth, 2007). As a result, values and cognitions differ not only between family and non-family firms but also within the group of family firms (Distelberg and Sorenson, 2009). Taking this into account, we further claim that the search breadth preferences of family SMEs also vary. In particular, we consider the following factors that may explain search breadth heterogeneity within the group of family businesses: (1) the level of family CEO education; (2) the percentage of non-family managers in the top management team (TMT); (3) the level of educational background diversity in the TMT; and (4) the interaction effect between the latter two variables.

Family CEO Education. The educational attainment of the family CEO may influence a family firm's openness toward a diversified set of innovation-related collaboration channels. Referring to family firms' varying propensity to join a cooperative, Gómez-Mejía et al. (2007) raise the question of whether there are "some unique attributes in terms of leadership style, educational background, personality traits, or family dynamics that explain why some family firms are capable of making business decisions with financial rather than socioemotional criteria in mind" (p. 132). Given his or her central role in the decision-making process of family SMEs, we suggest that the family CEO, and specifically the educational attainment of the CEO, is such a unique attribute.

Previous research has shown that the level of education is positively associated with rational approaches to managerial decision-making (Bantel and Jackson, 1989; Papadakis and Barwise, 2002). In other words, well-educated CEOs might be better able to balance the socioemotional and financial objectives of family firms (Distelberg and Sorenson, 2009). In our particular case, well-educated family CEOs are expected to put more emphasis on effective external resource acquisition during the innovation process than on protecting SEW. As a result, they may be associated with a broader network of external organizations.

Besides altering values and preferences in strategic decision-making processes, the level of CEO education also affects the absorptive capacity of a family firm. Hambrick and Mason (1984) predict that the amount, but not the type, of formal education will be positively associated with innovation. Educated executives have a greater cognitive diversity (Hitt and Tyler, 1991; Wally and Baum, 1994) and are better able to absorb new information (Barker and Mueller, 2002). Moreover, well-educated managers are likely to engage in boundary spanning, tolerate ambiguity and show ability for integrative complexity (Dollinger, 1984). Finally, higher levels of education enhance a person's receptivity to innovation (Becker, 1970a; 1970b). This is also reflected in the fact that more innovative organizations are led by individuals with higher levels of education (Kimberly and Evanisko, 1981; Thomas, Litschert and Ramaswamy, 1991). Taken together, these arguments indicate that the search breadth of a family SME is also positively related to the educational background of its top executive.

H2: Family SMEs managed by a CEO who graduated at a university have a higher search breadth than family SMEs led by CEOs with a lower level of education.

Next to CEO education, TMT characteristics may influence family SMEs' search behavior. We suggest that the degree of non-family management involvement and the educational background diversity within the TMT both have a direct effect and a combined synergistic effect on the search breadth of family SMEs.

Non-Family Management Involvement. Family businesses differ significantly concerning their degree of family involvement within the TMT (Kellermanns et al., 2012; Oswald, Muse and Rutherford, 2009). The proportion of family managers within the TMT reflects family participation in strategic decision-making. According to Gómez- Mejía et al. (2007), the strength of the family in management teams increases the focus on family goals and values and the strive to protect SEW (Gómez-Mejía et al., 2007). The presence of non-family managers, in contrast, shifts a firm's orientation toward financial goals and typically limits family managers' ability to derive family utility at the cost of the firm. Strengthening the group of non-family managers will influence the trade-off decision between continuing family discretion and a broad set of collaboration partners to promote innovation. Hence, we claim that the involvement of external managers will be related to higher search breadth of family SMEs. Following a similar line of reasoning, previous studies have found a positive relationship between the percentage of non-family managers within a family firm's management team and the professionalization of management (Dyer, 1988; McConaughy and Phillips, 1999). Furthermore, non-family management involvement has been associated with an increased use of outside information (Sonfield and Lussier, 2009).

At the same time, external managers may widen the cognitive diversity of a family firm by adding new perspectives not dominated by the family's experiences and tendency toward convergent thinking (Habbershon and Pistrui, 2002; Zahra, 2012). Through diversifying the managerial pool of competencies and expertise (Jennings and Lumpkin, 1989), non-family managers also strengthen a firm's absorptive capacity. In line with this, prior research has found that external managers enhance a firm's entrepreneurial orientation (Cruz and Nordqvist, 2012; Habbershon and Pistrui, 2002; Salvato, 2004), as well as its innovativeness (Carney, 2005; Steier, 2003). As a result, we suggest a positive relationship between the share of external managers in the management team and the search breadth of a family business.

H3: The percentage of non-family managers in the TMT is positively related to the search breadth of family SMEs.

Educational Background Diversity of the TMT. Next to the ratio of external managers, the educational background diversity of the TMT may also affect the degree to which family firms search broadly for innovation-related resources. By educational background diversity we refer to the heterogeneity of educational background directions within a TMT. Decision-making processes in highly homogeneous TMTs tend to suffer from social pressures to

conform and from limited consideration of alternatives (Janis 1982; McCauley 1998). This is particularly relevant for family SMEs in which a homogeneous TMT may support the dominant family objective of protecting SEW at the expense of strategic alternatives (Gómez-Mejía et al., 2007). Family leadership might become so powerful in such TMTs that other team members are hesitant to question the focus on SEW, causing a sort of family-imposed groupthink (Ensley and Pearson, 2005). In these situations, family SMEs will be more susceptible to suboptimal strategic choices - such as restricted and narrow search processes along familiar territories - favoring family discretion (Alexiev et al., 2010; Zahra, 2012). Prior research revealed that educational background diversity within top management is associated with a lower inclination toward convergent thinking (Knight et al., 1999) and a higher frequency of communication with outsiders (Ancona and Caldwell, 1992; McCauley, 1998). In line with this, the study of Dahlin, Weingart and Hinds (2005) shows that increasing educational diversity positively influences the range and depth of information use of teams. Educational background diversity seems to encourage teams to create a broader range of external linkages (Milliken and Martins, 1996). Family firms' tendency to conduct a narrow search for resources in well-established contexts (Levinthal and March, 1993; Zahra, 2012) may thus be mitigated by heterogeneous educational backgrounds of family business managers.

Educational background diversity also affects search breadth by enhancing the cognitive and information processing capabilities of TMTs (Alexiev et al., 2010; Dahlin, Weingart and Hinds, 2005). Heterogeneous TMTs can draw from a diversity of skills or knowledge and have therefore been associated with superior problem-solving, judgment and decision-making capabilities (Hinsz, Tindale and Vollrath, 1997; Van Knippenberg and Schippers, 2007). Members of such teams come from varying knowledge backgrounds, and their pooled cognitive resources may contribute to improved innovation capabilities and performance (Bantel and Jackson, 1989; Smith et al., 1994; Wiersema and Bantel, 1992). With regard to acquiring external resources, heterogeneous teams also possess less redundant peer networks, increasing access to unique resources (Ancona and Caldwell, 1992) and superior absorptive capacity (Van Den Bosch, Van Wijk and Volberda, 2003). Together these factors suggest that the educational background heterogeneity of TMTs broadens the search of family firms for innovation-related resources. Hence, we hypothesize:

H4: The educational background diversity within the TMT is positively related to the search breadth of family SMEs.

Interaction between Educational Background Diversity and Non-Family Involvement in the TMT. Considering the complex nature of strategic decision-making processes in TMTs, it seems conceivable to expect complementary effects between certain TMT characteristics on strategic outcomes (Hambrick, 1994; Ling et al., 2008). The TMT diversity literature has therefore stressed the need for "more complex models that consider moderating variables in explaining the effects of diversity" (Van Knippenberg and Schippers, 2007, p. 519). Findings from recent research confirm that benefits from TMT diversity are contingent on other TMT characteristics (Buyl et al., 2011; Simsek et al., 2005) because coordination costs associated

with diversity may also harm team performance if heterogeneous perspectives are not effectively expressed and integrated into decisions (Dahlin, Weingart and Hinds, 2005).

TMTs dominated by the owning family and by the primary objective of preserving SEW (Gómez-Mejía et al., 2007) are more disposed to groupthink and are less likely to benefit from educational background diversity. Discourse in these teams tends to be biased toward SEW considerations, and family-based social pressures will restrict the expression of controversial opinions from all members (Gómez-Mejía et al., 2007). Elevated levels of non-family management involvement allow for more open discourse, emphasizing the beneficial aspects of educational background diversity. In line with this, Simons, Pelled and Smith (1999) find that, in particular, job-related types of diversity such as educational background diversity interact with team process and debate to enhance performance. At the same time, non-family management involvement facilitates the absorption and processing of heterogeneous inputs (Milliken and Martins, 1996; Simons, Pelled and Smith, 1999). Accordingly, we suggest that educational background diversity within the TMT will be more advantageous when combined with substantial non-family management involvement in family SMEs.

H5: There is a positive interaction effect between the percentage of non-family involvement and the educational background diversity within the TMT on the search breadth of family SMEs.

4.3. METHODS

4.3.1. Sample

The sample used in our analysis consists of SMEs located in Belgium and the Netherlands. Firm information was retrieved from the Belgian Belfirst database and the Dutch Chamber of Commerce database. Surveys were sent to a random selection of 4,000 businesses (2,000 Belgian and 2,000 Dutch) fulfilling the following three selection criteria: (1) between 10 and 250 employees (in line with the European Union (EU) definition of SMEs); (2) privately owned; and (3) active in the manufacturing industry. The questionnaires were distributed in 2004 and were addressed to the CEOs. This approach is in line with the view that CEOs of SMEs are reliable key informants (Kumar, Stern and Anderson, 1993). In total, 355 questionnaires were returned, resulting in a response rate of 8.9 percent, which is comparable with previous studies of privately held firms (e.g., Schulze, Lubatkin and Dino, 2003). In order to ensure the strategic independence of all firms within the sample, all subsidiaries were left out in the analysis. Further, we excluded all observations with missing values for key variables and restricted our sample to firms that actually had the objective to be innovative²¹. In this way we guaranteed that none of the remaining 167 firms in our sample was indifferent about innovation and access to innovation-related resources. In line with previous research,

²¹ The objective to innovate was measured on a five-point Likert scale asking how important the objective to innovate was for a firm. Firms were categorized as having the objective to innovate if they indicated a 4 or a 5 for this item.

we checked for a potential nonresponse bias by comparing early respondents with late respondents, who are expected to be more similar to non-respondents (Kanuk and Berenson, 1975). The t-tests revealed that early and late respondents did not differ significantly with respect to any of the variables included in the study. Furthermore, larger-scale studies on SMEs that use a similar definition of family businesses reported a comparable share of family businesses and a similar average firm size within their samples (e.g., Fernández and Nieto, 2006). Therefore, we do not expect an important nonresponse bias in any of our variables.

As we collected data on the dependent and independent variables from the same respondent, we took several steps to mitigate and detect potential common-method bias. First, the fact that our variables were largely factual and non-affective in nature should limit concerns related to social desirability and the consistency motif (Podsakoff et al., 2003). Second, scale anchors and format were varied in the questionnaire to avoid method bias caused by commonalities across measures (Podsakoff et al., 2003). For the sake of completeness, we also performed Harman's single-factor test as suggested by Podsakoff et al. (2003). Five factors with eigenvalues above 1 were identified that together explain 76.06 percent of the variance. The first factor only accounted for 24.13 percent of the variance. As a consequence, we expect that common-source bias was not a major issue in this study.

4.3.2. Measures

Dependent Variable. The search breadth of a company is the dependent variable in this study. Similar to previous research by Laursen and Salter (2006), we define this variable as the number of external partners or search channels that firms rely upon in their innovative activities. Our questionnaire included six potential types of innovation partners, namely customers, suppliers, competitors, universities, public agencies and other organizations. The latter category included, among others, collaboration with private research institutions, consultancies, or trade associations. Those relationships are developed to access critical resources for the firms' innovation process. For each type of potential partner, respondents were asked whether or not their firms cooperated with them for innovation-related activities during the last three years. All six items were initially coded as binary variables, 1 being use of the type of partner and 0 being no use. The search breadth was then calculated as the sum of the six binary variables.

Independent Variables. There is currently no agreed-upon operational definition of a family firm (for overviews, see Chua, Chrisman and Sharma, 1999; Miller et al., 2007; Westhead and Cowling, 1998). However, the typical family firm has been characterized as a firm in which ownership and usually also management are controlled by a single family. This ownership and management control gives the family the power it needs to shape the firm's strategic decision-making (Chua, Chrisman and Sharma, 1999). Moreover, a distinctive feature of family firms is that this family power over decision-making will be directed toward behaviors that serve family-oriented considerations in addition to purely economic objectives (Chrisman, Chua and Sharma, 2005; Chua, Chrisman and Sharma, 1999; Gómez-Mejía et al., 2007). To help ensure this, we included as additional criteria the CEO's perception of the firm being a family firm (e.g., Westhead and Cowling, 1998; Zahra et al., 2008) and the

involvement of multiple relatives in the firm (e.g., Eddleston, Kellermanns and Sarathy, 2008; Miller, Le Breton-Miller and Scholnick, 2008), which increase the likelihood of family values and considerations influencing decision-making (Chua, Chrisman and Sharma, 1999; Miller et al., 2007). Therefore, a business was categorized as a family firm if it fulfilled the following four criteria, asked for in the survey: (1) one family owned at least 50 percent of the company's shares; (2) the firm was headed by a family CEO; (3) at least two family members were active in the firm; and (4) the respondent perceived the company to be a family firm. Based on this combination of criteria, a dummy variable was created (family firm = 1; non-family firm = 0) with 82 firms (49 percent) being classified as family businesses (for similar approaches, see, e.g., Naldi et al., 2007; Westhead, 1997).

Within the subsample of family businesses, we introduced three additional variables of interest. First, we were interested in the educational level of the family CEO. Respondents were asked to indicate whether or not they have attained a university degree. A dummy variable was created that takes the value 1 for CEOs who graduated at a university and the value 0 for those who did not. Second, for every family business we calculated the proportion of non-family managers active in the TMT. In accordance with other family firm scholars (compare Cruz and Nordqvist, 2012; Sonfield and Lussier, 2009), this measure was computed as the ratio of non-family managers divided by the total number of managers within the TMT. Finally, we consider the degree of educational background diversity within the management team measured on a five-point Likert scale (higher scores indicating a larger diversity of educational background directions within the TMT).

Control Variables. Several context- and firm-specific control variables were used in the analysis. Considering industry differences, a dummy variable indicating whether the firm was active in a medium- or high-technology versus low-technology industry (medium- or high-tech = 1; low-tech = 0) was used²². Furthermore, we controlled for industry growth (survey item "I consider the firm as being present in an emerging/ expanding industry"; evaluated on a five-point Likert scale). As firm-specific control variables, we added firm size (logarithmic function of the number of full-time equivalent employees), firm age (logarithmic function of the number of years since founding date) and R&D intensity (survey item "which percentage of the yearly sales turnover is spent on R&D activities?"; provided answer categories: 0,1–5,6–10,11–20,>20 percent). This selection of control variables is in line with previous research investigating the search breadth of companies (compare Laursen and Salter, 2006; Leiponen and Helfat, 2010)²³.

4.3.3. Analytic Procedure

We used a multiple regression approach to test our hypotheses. As described earlier, the dependent variable could take any integer value between zero and six. The appropriate

²² Based on the official Eurostat (2010) classification, firms were categorized as low-, medium, or high-technology firms according to their NACE (European industrial activity classification) codes.

²³ We also ran additional tests controlling for potential generational differences among family SMEs. We did not find a significant direct relationship between the generational stage and search breadth, nor did the inclusion affect any of our remaining relationships of interest.

regression technique for this type of dependent variable is ordered logistic regression (Wooldridge, 2002). In order to check for multicollinearity and heteroscedasticity, we also ran ordinary least squares (OLS) regressions and calculated the variance-inflation factors (VIF) and White's test statistic. This analysis showed that regression results were not affected by issues of multicollinearity or heteroskedasticity (largest $VIF < 10$). To test our hypotheses we ran eight different regression models with two different sample sizes. Models 1 and 2 used the complete sample ($n = 167$) to test H1, and Models 3–8 only included the subsample of family businesses ($n = 82$) to test H2–H5.

4.4. RESULTS

Thus far, we only assumed a positive link between a firm's search breadth and its innovation success. Though our cross-sectional data set did not allow us to test potential causal relationships, prior research has provided empirical evidence for a positive longitudinal effect of search breadth on product innovation (e.g., Leiponen and Helfat, 2010). In our case, partial correlation analyses controlling for the level of R&D expenditure also showed a significantly positive relationship between search breadth and product innovation ($pr = 0.22$; $p < .01$), as well as between search breadth and process innovation²⁴ ($pr = 0.18$; $p < .05$). These results are an additional indication for the positive role search breadth may play in the innovation process of SMEs.

Descriptive statistics and correlations for the complete sample are summarized in Table 4.1a. Table 4.1b provides the same information for the subsample of family businesses. Within the whole sample an average firm was 45.98 (standard deviation [$S.D.$] = 31.80) years old and had 48.27 ($S.D. = 39.01$) full-time equivalent employees. Slightly less than half of the firms (44 percent) were Belgian. The average search breadth of a company within our sample was 2.10 ($S.D. = 1.28$). In other words, on average, each firm developed partnerships with slightly more than two different external source types for innovation-related activities.

To provide deeper insight into the use of specific collaboration partners, Table 4.2 summarizes the proportions of SMEs that utilized each individual type of source. We observe that more than two thirds ($M = 0.71$) of all companies collaborated with a supplier and that every second firm ($M = 0.50$) cooperated with customers. Competitors were least frequently contacted for innovation-related purposes ($M = 0.13$). Furthermore, the table indicates differences concerning the use of the sources between family and non-family SMEs. Compared with non-family SMEs, family SMEs are less prone to collaborate with each of the six partner types.

Table 4.3 provides an overview of the regression results. Models 1 and 3 are the base models containing only control variables. Model 1 shows that the size and the R&D level of a firm affect search breadth significantly. Larger firms have a higher search breadth ($b = 0.72$; $p < .05$), and firms that do not perform their own R&D activities have a lower search breadth than companies that invest up to 10 percent of their sales in R&D.

²⁴ Product/process innovation was measured by means of five/three Likert-scale items adapted from Zahra, Neubaum and Huse (2000); Cronbach's alpha was 0.80/0.87.

TABLE 4.1a
Descriptive Statistics and Correlations (Complete Sample)

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10
1 Search Breadth	2.10	1.28										
2 Log(Firm Size)	3.61	0.71	.21***									
3 Log(Firm Age)	3.59	0.73	.08	.10								
4 No R&D Exp. (dummy)	0.07	0.26	-.22**	-.06	-.13							
5 R&D Exp. 1-5% of Sales (dummy)	0.54	0.50	-.05	.09	.10	-.30***						
6 R&D Exp. 6-10% of Sales (dummy)	0.26	0.44	.19**	-.09	.13	-.16**	-.64***					
7 R&D Exp. 11-20% of Sales (dummy)	0.09	0.29	.01	.07	-.18**	-.09	-.34***	-.19*				
8 R&D Exp. > 20% of Sales (dummy)	0.03	0.17	.01	-.05	-.15**	-.05	-.19**	-.11	-.06			
9 Medium/High-Tech Industry (dummy)	0.54	0.50	.11	.09	.16**	-.12	-.11	.16**	-.05	.16**		
10 Industry Growth	2.71	1.23	.13*	-.12	-.22***	-.14	-.11	.07	.18**	.07	.19**	
11 Family Firm (dummy)	0.49	0.50	-.19**	-.06	.06	.01	-.02	-.02	.07	-.03	-.09	.02

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 4.1b
Descriptive Statistics and Correlations (Only Family SMEs)

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1 Search Breadth	1.85	1.25												
2 Log(Firm Size)	3.57	0.70	.16											
3 Log(Firm Age)	3.64	0.62	.04	.02										
4 No R&D Exp. (dummy)	0.07	0.26	-.23**	-.03	-.13									
5 R&D Exp. 1-5% of Sales (dummy)	0.54	0.50	.09	.10	.13	-.30***								
6 R&D Exp. 6-10% of Sales (dummy)	0.26	0.44	.05	-.11	.20*	-.17	-.63***							
7 R&D Exp. 11-20% of Sales (dummy)	0.11	0.31	.04	-.03	-.35***	-.10	-.38***	-.21						
8 R&D Exp. > 20% of Sales (dummy)	0.02	0.16	-.11	.11	-.07	-.04	-.17	-.09	-.06					
9 Medium/High-Tech Industry (dummy)	0.50	0.50	.06	.15	.13	.00	-.15	.20	-.12	.16				
10 Industry Growth	2.73	1.21	.12	-.10	-.15**	-.21*	-.19*	.06	.37***	.04	.14			
11 CEO University Education (dummy)	0.23	0.42	.27**	-.04	.02	-.04	-.13	.21*	-.01	-.10	-.03	-.17		
12 % Non-Family Managers	0.44	0.31	.26**	.35***	.07	.15	.01	-.22**	.11	.26**	.15	-.01	-.12	
13 Educational Background Diversity	3.24	1.22	0.02	-.05	-.02	0.06	-.10	.14	-.10	-.03	-.08	-.05	.13	-.06

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 4.2
Means (Use of Individual Partner Types)*

Knowledge source	Overall (<i>n</i> = 167)	Family firms (<i>n</i> = 82)	Non-family firms (<i>n</i> = 85)
	<i>M</i>	<i>M</i>	<i>M</i>
Customer	0.50	0.48	0.52
Supplier	0.71	0.68	0.74
Competitor	0.13	0.12	0.14
University	0.26	0.22	0.29
Public agency	0.22	0.15	0.29
Other	0.28	0.21	0.35

* On average each firm cooperated with 2.10 different external partner types for innovation-related activities.

TABLE 4.3
Ordered Logistic Regression Analyses for Search Breadth

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>	<i>Model 6</i>	<i>Model 7</i>	<i>Model 8</i>
Log(Firm Size)	0.721** (0.206)	0.684*** (0.206)	0.560* (0.310)	0.628** (0.311)	0.340 (0.320)	0.552* (0.310)	0.338 (0.319)	0.337 (0.324)
Log(Firm Age)	0.175 (0.205)	0.245 (0.208)	0.110 (0.366)	0.215 (0.366)	-0.058 (0.372)	0.116 (0.369)	-0.053 (0.374)	-0.133 (0.377)
R&D Exp. 1-5% of Sales (dummy)	1.185** (0.587)	1.207** (0.586)	1.724* (0.893)	1.812** (0.904)	1.905** (0.954)	1.774** (0.898)	1.936** (0.955)	2.098** (0.981)
R&D Exp. 6-10% of Sales (dummy)	1.928*** (0.633)	1.916*** (0.631)	1.703* (0.956)	1.327 (0.979)	2.140** (1.027)	1.706* (0.959)	2.130** (1.028)	2.288** (1.055)
R&D Exp. 11-20% of Sales (dummy)	0.923 (0.729)	1.060 (0.734)	1.647 (1.084)	1.483 (1.094)	1.570 (1.134)	1.733 (1.089)	1.648 (1.137)	1.863 (1.163)
R&D Exp. > 20% of Sales (dummy)	1.627 (1.071)	1.645 (1.034)	-0.186 (1.586)	0.039 (1.606)	-0.813 (1.710)	-0.219 (1.579)	-0.847 (1.697)	-0.961 (1.675)
Medium/High-Tech Industry (dummy)	-0.006 (0.296)	-0.132 (0.303)	0.022 (0.435)	0.005 (0.436)	-0.120 (0.439)	0.066 (0.440)	-0.070 (0.445)	-0.086 (0.447)
Industry Growth	0.240* (0.128)	0.253** (0.129)	0.108 (0.190)	0.229 (0.200)	0.148 (0.189)	0.111 (0.190)	0.149 (0.188)	0.144 (0.188)
Family Business (dummy)		-0.756*** (0.293)						
CEO University Education				1.655*** (0.531)				
% Non-Family Managers TMT					1.857** (0.799)		1.837** (0.794)	-1.104 (1.734)
Educational Background Diversity TMT						0.128 (0.163)	0.124 (0.167)	-0.313 (0.288)
IA: % Non-Fam. Man.*Educ. Backgr. Div.								0.974* (0.519)
Log likelihood	-257.086	-253.692	-122.836	-117.706	-120.064	-122.528	-119.787	-117.978
Model chi-square	25.967	32.755	10.167	20.427	15.711	10.783	16.265	19.883
Observations	167	167	82	82	82	82	82	82

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Especially intermediary levels of R&D investment (6–10 percent of the sales), in particular, seem to complement a high level of search breadth ($b = 1.93$; $p < .01$). Though SMEs apparently need to conduct at least some internal R&D to be able to benefit from searching broadly, very high R&D investments seem to decrease expected benefits from search breadth.

Besides, the industry growth ($b = 0.24$; $p < .10$) has a significantly positive effect on the search breadth of our SMEs.

In the second model we added the family business dummy in order to test H1, which claimed that family firms have a lower search breadth than non-family firms. A log likelihood ratio test revealed that Model 2 predicts search breadth more effectively than Model 1 ($D = 6.79$; $df = 1$; $p < .01$). We observe a negative and significant coefficient ($b = -0.76$; $p < .01$) for the family firm dummy. This provides strong support for our first hypothesis.

Models 3–8 investigate the heterogeneity of search breadth within the family firm subsample. We tested H2 suggesting a positive effect of CEO university education on the search breadth of family businesses in Model 4. A likelihood ratio test shows that this model is superior to Model 3 ($D = 10.26$; $df = 1$; $p < .01$). We observe a positive and significant coefficient for the dummy CEO university education ($b = 1.66$, $p < .01$). Hence, H2 receives strong support²⁵. Model 5 includes the percentage of non-family managers in the management team to test H3. The likelihood ratio test confirms that this model fits better than Model 3 ($D = 5.54$; $df = 1$; $p < .05$). The positive coefficient of the percentage of non-family managers is significant ($b = 1.86$; $p < .05$). Hence, our third hypothesis is supported. H4 predicting that the search breadth of family SMEs is positively related to the educational background diversity with the TMT is tested in Model 6. The effect of this variable ($b = 0.13$; $p > .10$) and the likelihood ratio test statistic ($D = 0.62$; $df = 1$; $p > .10$) are statistically insignificant, indicating no support for H4²⁶. Lastly, Models 7 and 8 investigate the interaction effect between the share of non-family managers and the educational background diversity suggested in H5. The likelihood ratio test ($D = 3.62$; $df = 1$; $p < .10$) indicates that Model 8, which includes the interaction term, adds significant explanatory power compared with Model 7, which includes only the control variables and the two linear terms. The effect of the interaction variable is positive and significant ($b = 0.97$; $p < .10$), providing support for our last hypothesis.

4.5. DISCUSSION AND CONCLUSION

This study is the first to offer theoretical arguments and empirical results suggesting that family SMEs differ from non-family SMEs in their diversity of innovation partners and that substantial variation also exists within the group of family firms. Specifically, we show that family SMEs use a less diversified set of partners to acquire innovation-related resources than non-family SMEs. We contribute to the prior literature on search breadth by adding important insight into search breadth determinants, in particular with regard to search breadth preferences of different types of SMEs. Our study also adds knowledge to the stream of research on innovation in family firms, which until now focused mainly on internal aspects of the innovation process while neglecting externally oriented innovation cooperation. In

²⁵ The educational attainment of the CEO may also be relevant for the search breadth of non-family firms. Testing the same relationship in the subsample of nonfamily SMEs ($n = 85$), however, did not reveal a significant effect.

²⁶ As the degree of educational background diversity within the TMT could also be relevant for the search breadth of nonfamily SMEs, we tested this relationship among the group of nonfamily SMEs ($n = 85$). Here we do observe a positive and significant effect ($b = 0.35$; $p < .05$).

addition, our study contributes to the literature on family firms' external social capital or so-called bridging ties (e.g., Salvato and Melin, 2008). Prior work mostly emphasizes family firms' benefits in building and maintaining external network ties, for instance because of access to family members' personal networks and the family's transgenerational outlook and long-standing reputation (Arregle et al., 2007; Miller, Le Breton-Miller and Scholnick, 2008; Salvato and Melin, 2008). Our study, however, suggests that those external social capital benefits may apply primarily to nonintrusive ties not threatening the family's SEW and network configurations not exceeding the controlling family's limited cognitive and absorptive capacity. From a practical perspective, creating awareness of family SMEs' tendency to search too narrowly for innovation-related resources may stimulate these firms to diversify their portfolio of innovation partners.

Besides, this paper clarifies the determinants of search breadth variance within the group of family firms and identifies some options these firms might have for broadening their search horizon. Our findings suggest that family firms might bridge the search breadth gap compared with their non-family counterparts by selecting either a better educated family CEO or a higher proportion of non-family managers. Attracting non-family managers and emphasizing education in the training and selection of prospective family CEOs may lower the risk of overreliance on socioemotional considerations in decision-making and increase cognitive diversity, thereby proving valuable for those family SMEs seeking to broaden their search for innovation resources. While educational background diversity within the TMT is positively related to the search breadth of non-family SMEs, for family SMEs this relationship apparently only holds when strong educational background diversity is combined with higher levels of non-family involvement. It seems that SEW considerations and family-based social pressures will otherwise limit open discourse and thereby mitigate the benefits of educational background diversity for the search breadth of family SMEs (Gómez-Mejía et al., 2007).

Overall, our results are in line with the behavioral theoretic framework adopted in this study. Decision-makers indeed seem to have idiosyncratic preferences regarding strategic choices such as the search breadth of a firm that impact the long-term development of a business. Not only economic considerations, but also psychological and cognitive factors, may affect the scope with which SMEs search for innovation-related resources. Our findings suggest that decision-makers in family firms, because of their loss aversion with respect to SEW, aim to maximize family control and minimize external influences even if this affects long-term viability. Thus, family SMEs prefer lower levels of search breadth though this may lead to an inadequate stock of resources during the innovation process. This finding complements the work of Gómez-Mejía and colleagues, who have shown that family firms pursue lower levels of domestic and international diversification (Gómez-Mejía, Makri and Larraza-Kintana, 2010) and hesitate to join a cooperative (Gómez-Mejía et al., 2007) because of their fear of jeopardizing SEW. Our paper also complements the recent work of Zahra (2012) on organizational learning. Specifically, we recognize that family control may increase a firm's economic incentive to learn across a variety of fields and areas for innovation purposes, but suggest that they will do so via mechanisms that do not limit the family's SEW such as, for instance, industry analyses and personal marketing with direct contact to clients

(Miller, Le Breton-Miller and Scholnick, 2008; Zahra, 2012) rather than partnering with external parties.

Further, family SMEs may lack the necessary cognitive diversity and absorptive capacity to cope with a broader search strategy. Previous research indicated that the breadth of knowledge sources may be subject to diminishing marginal returns and that over-search might also hinder innovation performance (Katila and Ahuja, 2002; Laursen and Salter, 2006). In other words, the higher costs and complexity of simultaneously managing multiple partnerships can lead to diseconomies for firms with constrained resources (Belderbos, Carree and Lokshin, 2006).

Besides differences between family and non-family businesses, we also proposed heterogeneity between the search breadths of different types of family firms and identified various ways in which family firms may promote their external cooperation activities. One option for family SMEs concerns the level of CEO education. Our findings suggest that the educational attainment of a CEO is positively related to the level of search breadth in family SMEs. This result is consistent with Salvato's (2004) proposition that entrepreneurship in family firms is intrinsically related to individual CEO characteristics. The selection of a graduated CEO may lead to a better balance between family and business objectives. In addition, it can widen the cognitive diversity and the potential absorptive capacity of a family firm. This makes the firm more receptive to innovation and external resource acquisition. The fact that CEO education was only related to search breadth in the subsample of family SMEs implies that the impact of CEO education on strategic choices is more substantial in family SMEs than in non-family SMEs. Nepotistic promotion and employment decisions concerning family members lead to negative consequences for family-controlled businesses (Lubatkin et al., 2005) such as limited access to innovation-related resources. Therefore, family firms should prioritize the level of education when selecting successors. Predecessors should also encourage the succeeding generation to obtain knowledge from higher education before they initiate the transfer of power and control.

Our empirical analysis also revealed that the proportion of external managers in the TMT is positively related to the search breadth of family firms. This finding highlights the value of non-family managers in the professionalization of family firms (Dyer, 1989). Specifically, it signals that management teams dominated by members of the family may have an overly internal focus (Nordqvist, 2005) and that hiring externals may stimulate external resource acquisition. Adding non-family managers to the management team seems to widen the set of alternative assumptions or opinions considered (Schweiger, Sandberg and Ragan, 1986) and thus the cognitive diversity of family SMEs.

Our findings further indicate that the degree to which the search breadth of family SMEs is stimulated by the level of educational background diversity is contingent on the ratio of non-family managers within the TMT. Only augmenting educational background diversity within the TMT has no direct effect on search breadth in contrast to our prediction. It seems that benefits from educational background diversity can only be reaped when a powerful group of non-family managers lowers the emphasis on SEW and thereby opens up the debate for alternative perspectives. This finding accords with previous research suggesting interactive effects of debate and diversity among TMTs (Simons, Pelled and Smith, 1999). It

also emphasizes the role of potential complimentary effects between specific TMT characteristics on strategic outcomes such as the search breadth of family SMEs.

This research is not without limitations. First, the generalizability of our results may be limited, as we exclusively observed manufacturing firms in the Netherlands and Belgium. As a result, it would be useful to expand the scope of this investigation to other countries and other industries in order to extend our findings. Second, our investigation focused on the search breadth of firms while we neither incorporated information about the number of partners from the same type of source nor about the intensity of these relationships, the search depth of firms. It might be the case that family firms compensate for a lack of search breadth by a repeated use of a single type of innovation partner. Previous studies pointed out that firms may face a trade-off between depth and breadth in their innovation objectives (Cohen and Levinthal, 1990; Helfat, 1994; Nelson and Winter, 1982). Future studies may investigate the search breadth, together with the search depth, of family and non-family SMEs to see the interplay between these two search dimensions. This research topic may also benefit from further research examining whether family firms reach the tipping point (Laursen and Salter, 2006) after which the use of an additional source actually decreases innovative performance earlier than non-family firms. Finally, in this paper we did not focus on the nature and time-horizon of the collaborations. Scholars may examine how far family firms prefer strategic over tactical cooperation agreements and to which degree their innovation-related collaboration entails equity investments. On the one hand, it might be that family firms prefer more tactical forms of R&D cooperation that provide them with a maximal amount of authority and a minimal loss of family control. On the other hand, strategic investments entailing equity investments in external organizations might be better aligned with the long-term perspective often associated with family businesses. Despite these limitations, our study contributes to the literature by shedding light on the innovation-related search behavior of family and non-family SMEs from a behavioral perspective.

5. INNOVATION OPENNESS AND USE OF CONTRACTS: A COMPARISON OF FAMILY-CONTROLLED AND NON-FAMILY FIRMS²⁷

Abstract

In this study, we develop and test the idea that the idiosyncratic mix of goals, some economic and some non-economic, being pursued by family-controlled firms affects their engagement in, and governance of, open innovation. Specifically, we propose that – in comparison to non-family firms – the range of innovation activities being opened for external collaboration and the number of innovation partner types being used are more restricted among family-controlled firms, and that these firms rely to a lesser extent on formal contracting as a governance tool in their innovation partnerships. Analyses using data from the Mannheim Innovation Panel on the open innovation practices of German manufacturing firms offer empirical support for our hypotheses.

²⁷ The authors Nicolas Classen and Yannick Bammens contributed equally to this paper. Yannick Bammens acknowledges financial support from Network Social Innovation (NSI), Maastricht University. Nicolas Classen gratefully acknowledges support from the Centre for European Economic Research (ZEW) in Mannheim. Previous versions of this paper have been presented at the Academy of Management conference 2013, the Ifera conference 2013, as well as the NYU / Columbia Business School Doctoral Conference 2013.

5.1. INTRODUCTION

Family-controlled firms (FFs) represent a central organizational form in most economies around the world (Gedajlovic et al., 2012; IFERA, 2003), and this family control may have a substantial impact on a firm's strategic decision-making and behaviors (Gómez-Mejía et al., 2011). In their analysis of the differences between FFs and non-family firms (NFFs) prior studies have mainly relied on existing paradigms such as agency theory (e.g., Chrisman, Chua and Litz, 2004), stewardship theory (e.g., Miller, Le Breton-Miller and Scholnick, 2008) and the resource-based view (e.g., Sirmon and Hitt, 2003). While the application of existing paradigms to the realm of FFs has been insightful in many ways, use of this "borrowed logic" has been criticized for not adequately dealing with many of the non-financial issues that are central to this organizational form (Berrone, Cruz and Gómez-Mejía, 2012). Recently, a promising theoretical framework emerged – i.e., the socioemotional wealth model – which does capture this essence of FFs and seems to explain many of their distinctive behaviors (Gómez-Mejía et al., 2011; Gómez-Mejía et al., 2007). As noted by Berrone, Cruz and Gómez-Mejía (2012), the socioemotional wealth model "builds on the foundations of prior family firm studies" and is "anchored in the behavioral tradition within the management field" (p. 259). Socioemotional wealth refers to the non-financial utilities that family owners derive from their business, and this model suggests that the preservation of socioemotional wealth represents the primary reference point in the decision-making process of FFs (Gómez-Mejía et al., 2007). As such, a central characteristic of FFs seems to be their combining of common economic objectives with a dominant set of socioemotional considerations (Bammens, Voordeckers and Van Gils, 2011; Chrisman et al., 2012; Gedajlovic et al., 2012).

The purpose of this study is to examine how FFs, with their associated socioemotional focus, differ from NFFs with respect to their open innovation practices. Prior research has used a variety of conceptualizations of open innovation. Following Laursen and Salter (2004; 2006), we define open innovation as the degree to which organizations use external sources of innovation in their innovation activities. This definitional approach is line with what Dahlander and Gann (2010) term "inbound innovation sourcing" and the logic is that the stronger the degree of external sourcing of innovation, the more open will be the firm's search strategy. It differs from the conception of strategic alliances, because it focuses more on the innovation-purpose of the partnerships and the extent to which multiple external sources are used during the innovation process. Open innovation has received a great deal of scholarly interest in recent years, with researchers highlighting many of its advantages such as the acquiring of complementary knowledge and technologies, access to partner networks and resources and the sharing of risks (e.g., Chesbrough, 2003; Laursen and Salter, 2006; Leiponen and Helfat, 2010; Snow et al., 2011). However, to date this open innovation literature has been imbalanced in its focus on potential benefits (Lichtenthaler, 2011), with relatively little systematic research devoted to the challenges and difficulties that might explain why some organizations are less likely than others to open their innovation process to external partners (Ritala and Hurmelinna-Laukkanen, 2013). Building on the socioemotional wealth model (Gómez-Mejía et al., 2011), we will propose that FFs are characterized by a lower engagement in open innovation. Moreover, we will suggest that FFs rely to a lesser

extent on formal contracting as a governance tool in their innovation collaborations. Specifically, we will develop the argument that the idiosyncratic set of mixed motives that characterizes FFs increases the divergence of interests problem with innovation partners (Almirall and Casadesus-Masanell, 2010), and makes the use of contracts to mitigate risks more problematic because of heightened subjectivity and complexity (Gong et al., 2007; Kloyer and Scholderer, 2012). Our derived hypotheses will be tested using data from the Mannheim Innovation Panel on the innovation openness of 508 German manufacturing firms, and the use of contracts in innovation collaborations among a subsample of 399 firms.

This study makes several valuable contributions to the academic literature. First, given the prevalence of FFs as a business form (Gedajlovic et al., 2012; IFERA, 2003) and the importance of innovation-related activities for economic progress (Trott, 2008), we need to gain a better understanding of the interrelationships between family control and the various aspects of the organizational innovation process. Some prior studies have examined R&D investments in a FF setting (e.g., Chrisman and Patel, 2012; Classen et al., forthcoming; Munari, Oriani and Sobrero, 2010; Munoz-Bullón and Sanchez-Bueno, 2011), with evidence suggesting that family involvement is negatively associated with R&D spending. Few studies, however, have addressed the impact of family control on other elements of the innovation process, in particular aspects of open innovation (for a notable exception, see Classen et al., 2012). Our study advances knowledge on this topic by developing and testing the idea that FFs face greater challenges in opening their innovation process to external partners because of their idiosyncratic set of mixed motives. Second, by exploring how ownership structure and goal configurations may constrain organizations' open innovation activities, this study also sheds further light on the so far under-researched topic of open innovation difficulties and risks (Dahlander and Gann, 2010; Lichtenthaler, 2011). The insights developed in this study help explain how departures from pure economic instrumentality may put restrictions on organizations' openness to and governance of innovation collaborations.

The article is structured as follows. In the next section we develop our theoretical model and derive several hypotheses. Then, we describe the methods used in this study and present our empirical results. To conclude, we discuss the main implications of this research together with its shortcomings and directions for future research.

5.2. THEORY AND HYPOTHESES

5.2.1. Innovation in Family-Controlled Firms

There is substantial theoretical and empirical evidence for the idiosyncratic nature of innovation processes in FFs. Prior research consistently shows a negative relationship between family ownership and the level of innovation input intensity (De Massis et al., 2013a). They typically prefer conservative innovation strategies in which they refrain from substantial investments in R&D (Chrisman and Patel, 2012; Patel and Chrisman, forthcoming). On the contrary, we know much less about how FFs make use of external sources of innovation. Recently conducted quantitative research provides preliminary support for the notion that family firms are also generally more reluctant to acquire external

technology (Classen et al., 2012; Kotlar et al., forthcoming). More qualitative approaches, however led to the opposite observation that FFs are more inclined to rely on external sources of knowledge and technologies during innovation activities (De Massis et al., 2013b). Such inconsistent findings warrant additional research on how FFs and NFFs differ regarding the use of external sources of innovation.

5.2.2. Goal Idiosyncrasies and Innovation Openness

While opening the innovation process to external partners holds the potential for significant advantages, there are also several challenges associated with such innovation collaborations (Dahlander and Gann, 2010; Van de Vrande et al., 2009). As with all forms of collaboration, a key potential drawback of open innovation concerns the loss of control over certain aspects of the innovation process, which is especially problematic when partners have diverging preferences (Almirall and Casadesus-Masanell, 2010; Kloyer and Scholderer, 2012; Panico, 2012). Indeed, when opening the innovation process to external partners, some decisions that could be made freely in a closed system are now influenced and constrained by partners who pursue their own interests (Almirall and Casadesus-Masanell, 2010). In what follows, we will argue that the preferences of FF decision-makers tend to be more idiosyncratic than those of their non-family counterparts, and that this makes the loss of control issue more problematic for FFs.

Concerning the set of objectives being pursued, FFs have been argued to be more heterogeneous and idiosyncratic in comparison to NFFs (Berrone, Cruz and Gómez-Mejía, 2012; Chrisman and Patel, 2012). The main reason for these idiosyncrasies can be found in their combining of a varied set of socioemotional family-centered goals with traditional economic objectives also found in NFFs (Chrisman et al., 2012; Gómez-Mejía et al., 2011). Socioemotional considerations come in a wide variety of forms, and depending on the family's specific values, feelings and intentions, FFs vary considerably in the emphasis they put on different socioemotional dimensions as well as in the weights they use when combining socioemotional with economic objectives (Berrone, Cruz and Gómez-Mejía, 2012; Chrisman et al., 2012). Examples of socioemotional considerations include, amongst others, the opportunity to be altruistic to relatives, the upholding of family values and traditions through the business, the desire to build and maintain a favorable reputation for the family in the local community and the intention to pass the firm on to future generations (Berrone et al., 2010; Gómez-Mejía, et al., 2007; Schulze et al., 2001). Thus, given the possibilities FFs have in terms of the importance they attached to these socioemotional family-centered goals and its different dimensions, FFs generally have more idiosyncratic goal configurations when compared to NFFs employing relatively generic economic objectives as their frame of reference (Berrone, Cruz and Gómez-Mejía, 2012; Chrisman and Patel, 2012).

Considering that open innovation involves the loss of control over elements of the innovation process, diverging interests among collaborating partners jeopardize the potential contribution of open innovation activities (Almirall and Casadesus-Masanell, 2010; Pullen et al., 2012). As FFs tend to employ more idiosyncratic goal sets, these firms can be expected to be more averse to the loss of control and thus less inclined to include external partners in their

innovation process (De Massis, Frattini and Lichtenthaler, 2012). In other words, FFs' goal idiosyncrasies make it more problematic to find compatible innovation partners and may lead to a preference for more closed systems of innovation. In line with this reasoning, prior studies have indicated that owning-families are generally reluctant to involve influential outsiders in their decision-making because doing so reduces the family's discretion in pursuing its particularistic agenda (Bammens, Voordeckers and Van Gils, 2011; Gómez-Mejía et al., 2011). This argumentation is also supported by the recent work of Classen and colleagues (2012) who found that, among their sample of 167 Belgian and Dutch manufacturing SMEs, FFs relied on a narrower set of innovation partner types compared to NFFs.

In sum, the goal idiosyncrasies that characterize FFs (Chrisman and Patel, 2012) likely make them more reluctant to cede control over parts of the innovation process to external partners (Almirall and Casadesus-Masanell, 2010; Pullen et al., 2012). NFFs on the other hand, tend to pursue more generic economic objectives, which should allow them to more easily find partners with compatible preferences and to open their innovation process for external collaboration (Classen et al., 2012). In this study, our data allow us to capture two aspects of the extent to which a firm engages in open innovation, namely the range of innovation activities being opened for external collaborations and the range of innovation partner types being used. Indeed, the innovation process is made up of several activities (e.g., idea generation, development, design, testing, market introduction) and different types of innovation partners can be used (e.g., clients, suppliers, competitors, research institutions) (Chesbrough, 2003; Dittrich and Duysters, 2007; Laursen and Salter, 2006). We propose, therefore, that FFs' goal idiosyncrasies require these firms to be more selective than NFFs in terms of the innovation activities they open for external collaboration and in terms of the types of partners they collaborate with. This results in our first set of hypotheses:

H1a: Compared to NFFs, the range of open innovation activities is more restricted among FFs.

H1b: Compared to NFFs, the range of open innovation partner types is more restricted among FFs.

5.2.3. Mixed Goals, Trust and Contractual Governance

For those firms that decide to open some aspects of their innovation process and enter innovation partnerships, a critical choice pertains to the use of formal contracting as a governance tool (Kloyer and Scholderer, 2012; Panico, 2011; 2012; Ritala and Hurmelinna-Laukkanen, 2013). As with all types of collaboration, innovation partners face the risk of opportunistic self-serving behaviors based on information asymmetries and hidden agendas (Belderbos et al., 2010; Vanhaverbeke, Gilsing and Duysters, 2012). The purpose of formal contracting is to limit the scope of opportunism by specifying and codifying elements such as, for instance, the partnership's objectives, the rights and duties of each partner and the rules and procedures for making decisions and for adapting to contingencies (Gong et al., 2007; Malhotra and Lumineau, 2011; Poppo and Zenger, 2002). By way of these detailed and

clearly articulated specifications, “the court can be used to force transactors to perform to the literal terms of the contract” (Wuyts and Geyskens, 2005: p. 106). In what follows, we will argue that the characteristics of FFs’ goal sets limit their reliance on formal contracting as a governance tool for the innovation collaborations they enter.

FFs’ combining of economic objectives with a varied set of socioemotional objectives not only leads their goal sets to be more idiosyncratic than those of NFFs, the pursuit of these mixed motives also introduces a degree of subjectivity in the decision and evaluation process as well as a need for often intricate ad-hoc trade-offs (Bammens, Voordeckers and Van Gils, 2011; Chua, Chrisman and Bergiel, 2009; Gedajlovic et al., 2012). As such, the mix of motives, some economic and some non-economic, that characterizes FFs as an organizational form (Berrone, Cruz and Gómez-Mejía, 2012), can be expected to add considerably to their transactional complexity. As stated by Gong and colleagues (2007), “[c]ontract completeness is a function of the bounded rationality of each party, and such rationality becomes more confined when transactional complexity rises” (p. 1024). It will thus likely be more difficult and costly for FFs to articulate ex ante in a precise, unambiguous manner the various decision and evaluation criteria for contractual stipulation (Gong et al., 2007; Poppo and Zenger, 2002). As a result, FFs can be expected to favor less contractual forms of governance, leaving certain aspects of the innovation collaboration unspecified in order to allow for subjective interpretations and flexible trade-offs.

The above line of reasoning accords with the observation that FFs generally prefer informal systems and more relational bonds in their dealings with other parties (e.g., Gómez-Mejía et al., 2011). They carefully choose their partners and they tend to rely on well-established social network ties (Miller, Le Breton-Miller and Scholnick, 2008). Partnerships of FFs are hence commonly based on kinship and community which form the basis for interpersonal trust (Carney, 2005). Further, FFs have a stronger disincentive to behave opportunistically, because the reputation of the family is typically closely linked to the reputation of the business which frequently also carries the family name (Deephouse and Jaskiewicz, 2013). FFs are hence more likely to rely on reciprocity and less on specified obligations in the form of contracts. In their innovation partnership family business may therefore be more inclined than their non-family counterparts to rely on trust as an alternative to contractual forms of governance (Steier, 2001; Sundaramurthy, 2008). This argumentation results in the following hypothesis:

H2: Compared to NFFs, reliance on formal contracting as a governance tool for innovation partnerships is lower among FFs.

5.3. METHODS

5.3.1. Sample and Data

To test the hypothesized relationships, we use data from the Mannheim Innovation Panel (MIP), the annual German innovation survey conducted by the Centre for European Economic Research (ZEW). The representative stratified survey among manufacturing and

service sector firms is the German contribution to the European Community Innovation Survey (CIS). Comparable innovation surveys are conducted in most OECD countries around the world except for the US. They are based on common definitions and methodologies specified in the Oslo manual (OECD and Eurostat, 2005). We link data from the MIP for the years 2007 and 2008 to the database of the credit rating agency *Creditreform* to add complementary firm information. A combination of these two years is useful for our research purpose because the 2007 survey for the first (and up till now last) time included a question on family control while the 2008 survey included extensive information on firms' innovation-related collaboration activities. Hence, we draw the data for our independent and most control variables from the 2007 survey (referring to activities in the years 2004-2006) and for our dependent variables from the 2008 survey (referring to activities in the years 2005-2007).

For the 2007 survey 29,985 companies were contacted with a response rate of 20.5%. For the shorter 2008 survey 21,060 companies were contacted with a response rate of 32%²⁸. From the original sample of 3,713 firms which filled out the MIP survey in both years, we made several restrictions serving our purpose of comparing the innovation collaboration practices of FFs and NFFs. First, we focus on manufacturing firms to enhance the comparability of the innovation processes among the analyzed firms, and thus excluded all companies that are primarily active in the service sector (minus 1,724 firms). Further, we used the filter variable from the MIP to delete firms that neither had any product or process innovations in the period 2005-2007, nor planned any of these in the year 2008 or 2009 (minus 398 firms). This warrants that all firms within our sample generally have the intention to innovate²⁹. To further enhance the comparability of firms within our sample, we also restricted our analyses to firms with at least 10 employees (minus 266 firms). Finally, all firms with missing values for any of our variables were omitted (minus 817 firms). This leaves us with a final sample of 508 German manufacturing companies to be included in our analyses.

5.3.2. Measures

Dependent variables. Our first dependent variable *range of open innovation activities* represents the openness of firms throughout the entire innovation process, and is measured as the sum of innovation activities in which the firm has at least one innovation partner. For each of the following five innovation activities, respondents were asked to indicate whether their firm collaborated with any innovation partner: (1) idea generation, (2) research and development (R&D), (3) design, (4) testing and preparation for sale, (5) market launch.

²⁸ To check for a potential non-response bias more than 4,000 non-responding firms were contacted via telephone for the year 2007; a probit estimation controlling for size and industry suggested no significant differences in the probability of innovating between responding and non-responding firms.

²⁹ Eliminating the non-innovating firms from our sample may potentially introduce a selection bias, because innovating firms may have already solved most of socio-emotional strains that normally act as impediments to innovate. We tested and controlled for such a potential selection bias in an additional regression (not reported here for brevity) which includes the inverse Mills ratio of the probability of being an innovating firm. This additional analysis shows that our findings are not affected by selectivity.

Hence, our variable range of open innovation activities is an integer number between zero and five.

The second dependent variable *range of open innovation partner types* reflects a firm's degree of openness towards a diversified set of partner types during the innovation process. It is measured as the sum of innovation partner types that a company uses for innovation-related purposes. Respondents were asked about the importance of innovation collaborations with (1) customers, (2) corporate clients, (3) suppliers, (4) competitors, (5) service firms and (6) universities and research institutes (1 = important; 0 = unimportant/not relevant)³⁰. Hence, our variable range of open innovation partner types is an integer number between zero and six. Similar measures of openness during the innovation process have been used in previous related studies (e.g. Classen et al., 2012; Laursen and Salter, 2006; Leiponen and Helfat, 2010).

The third dependent variable *reliance on formal contracting* indicates to what extent a firm employs formal contracting in the governance of its innovation partnerships. For each partner type that was considered to be an important innovation partner, respondents indicated to what extent these collaborations were based on a contractual agreement between the partners (0 = never; 1 = sometimes; 2 = always). We then calculated the average reliance on formal contracting across the different used partner types. This results in a continuous number between zero and two which is only observed if companies had at least one innovation partner ($n = 399$).

Independent variable. The family-controlled firms among the responding companies were identified based on the following question included in the 2007 MIP survey: "Is your enterprise controlled by a family - or part of an enterprise group controlled by a family? In case of an enterprise controlled by a family, family members hold at least 50% of the company's shares." Although no consensus exists in the literature on an operational FF definition, most scholars agree that the family must be the dominant coalition in the firm with authority over corporate decision-making (Chrisman, Chua and Sharma, 2005; Chua, Chrisman and Sharma, 1999). Typically, this requires that a single family holds a significant fraction of the company's shares and this single criterion has frequently been used to classify FFs (e.g., Ang, Cole and Lin, 2000; Barth, Gulbrandsen and Schone, 2005; Holderness and Sheehan, 1988; Maury, 2006). In order to examine differences between FFs and NFFs regarding their open innovation practices, we thus include the FF dummy variable (0 = NFF; 1 = FF) as a predictor in each of the three regressions.

Control variables. In order to account for exogenous influences on companies' open innovation practices, our study includes several firm- and industry-level control variables. *Firm size* is measured as the logarithmic function of the number of full-time equivalent employees. *Firm age* is measured as the logarithmic function of the number of years since firm foundation. *Part of a national group* and *part of an international group* are two dummy

³⁰ Innovation partners are defined in the MIP/CIS as all companies or institutions that a firm collaborates with to pursue the goal of developing and introducing new products and processes. The collaboration can vary from an informal exchange of ideas to a formal cooperation. An innovation partnership is also present if the new products/processes are not introduced by the responding company but by their partner, meaning that the company supports innovation projects of other firms.

variables indicating whether the firm is a subsidiary of a national or an international group; the excluded base category represents firms that are neither part of a national nor of an international group. *Human capital* is measured as the percentage of employees with a university degree. *Product diversification* equals the percentage of sales that was not generated from the number one product. *Training intensity* is an indicator for the amount of money spent on training per employee. *Export intensity* is measured as the percentage of sales from exports. Further, we included two dummies to control for the innovativeness of the firm: (a) a first dummy variable equals one if the company reported any *investments in innovation*³¹; (b) a second dummy variable *patent possession* equals one if the firm used patents as a strategy to protect its intellectual property (IP) in the previous three years. We also control with a dummy for whether the firm has experienced any *IP violation* in the same period³². To account for industry differences within our sample, we include eleven industry dummies in the regressions. In addition, we use two five point Likert scale items (1 = very weak; 5 = very strong) to control for the perceived intensity of *competition* in the major market regarding (a) *new product development* and (b) *quality*. In the regression testing Hypothesis 2, we additionally include a dummy variable for each of the six potential *partner types* (see above) with a value of one if the firm uses that type. This way, we ensure that our results concerning a firm's reliance on formal contracting are not driven by systematic differences between FFs and NFFs in the use of specific partner types.

5.3.3. Analytic Procedure

In our analyses we account for the censored nature of our dependent variables. The two endogenous variables indicating firms' openness during the innovation process are integer numbers from zero to five and zero to six, respectively. This implies the use of ordered logistic regression to test Hypotheses 1a and 1b. The dependent variable reliance on formal contracting is a continuous variable left-censored at zero and right-censored at two. Therefore, we test Hypothesis 2 by means of a Tobit regression.

5.4. RESULTS

Table 5.1 shows descriptive statistics and correlations for all variables used in this research. On average, firms in our sample collaborate in 3.34 stages of the innovation process and with 2.59 different partner types. The average use of contracts is 0.93, indicating a modest average use of contracts in innovation collaborations. Notably, the FF variable exhibits a significant negative correlation with all three dependent variables.

³¹ This refers to all expenditures for innovation activities (e.g., including licensing in). Instead of this dummy variable, we also controlled for a more focused and continuous measure of internal R&D expenses in additional tests. All hypothesized effects remained significant when using this alternative control. Yet, we do not use this control variable in our main analyses because of the relatively high number of missing values on this variable.

³² Violation of IP is defined in the MIP/CIS as a situation in which the responding company experienced the use of their technical inventions, the replication of their business models, or the use of their trademarks or design by other firms.

Table 5.2 and 5.3 report some additional descriptives on FFs' and NFFs' engagement in open innovation with respect to innovation activities being opened and partner types being used, respectively. These descriptives reveal that both FFs and NFFs seem to have a preference for opening early activities of the innovation process (i.e., idea generation and R&D) and for collaborating with their customers. Moreover, while differences between FFs and NFFs may be more pronounced for some categories (e.g., design for innovation activities and competitors for partner types), these descriptives do indicate that a lower score for FFs is not limited to a single innovation activity or partner type. Table 5.4 provides an overview of the distribution of FFs and NFFs across industry groups; FFs are overrepresented in some industries like wood and paper, while they are underrepresented in others such as transport equipment or energy. Overall, we observe a broad distribution of FFs and NFFs across all twelve sectors.

Table 5.5 depicts the results of our regression analyses to test Hypotheses 1a and H1b. For each dependent variable, the base model only includes the control variables (i.e., Models 1 and 3), the second includes the FF variable in addition (i.e., Models 2 and 4). Hypothesis 1a predicted that FFs have a lower range of innovation activities being opened for external collaboration compared to NFFs. A log likelihood ratio test revealed that Model 2 predicts the dependent variable more effectively than Model 1 ($D = 5.44$; $df = 1$; $p < .05$). In line with our hypothesis, we observe a negative and significant coefficient ($b = -0.45$; $p < .05$) for the FF variable in Model 2. Concerning the control variables, firm size, human capital, competition intensity regarding quality, investment in innovation and patent possession are positively related to the range of open innovation activities. Hypothesis 1b predicted that FFs use a lower range of open innovation partner types compared to NFFs. A log likelihood ratio test showed that Model 4 predicts the dependent variable more effectively than Model 3 ($D = 6.00$; $df = 1$; $p < .05$). As hypothesized, we observe a negative and significant coefficient ($b = -0.47$; $p < .05$) for the FF variable. Next to this variable, patent possession is positively associated with the range of innovation partner types.

Finally, Table 5.6 reports the results on the use of formal contracting by FFs versus NFFs.

TABLE 5.1
Descriptive Statistics and Correlations^a

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1 Range of open innovation activities	3.34	1.56																	
2 Range of open innovation partner types	2.59	1.41	0.46																
3 Reliance on formal contract	0.93	0.64	0.07	0.19															
4 Firm size	4.64	1.35	0.14	0.11	0.26														
5 Firm age	3.19	0.93	-0.04	-0.05	-0.04	0.23													
6 Part of national group	0.15	0.36	0.02	-0.02	0.01	0.07	0.03												
7 Part of international group	0.28	0.45	0.10	0.08	0.15	0.46	0.01	-0.26											
8 Human capital	15.89	16.05	0.12	0.19	0.22	-0.19	-0.21	-0.05	0.12										
9 Product diversification	37.06	26.03	-0.05	-0.04	-0.01	-0.17	-0.17	0.08	-0.01	0.00									
10 Competition: New product development	2.89	0.89	0.09	0.05	0.05	0.02	-0.03	-0.04	-0.05	0.09	-0.03								
11 Competition: Quality	4.08	0.77	0.03	0.10	-0.06	0.01	-0.07	0.00	0.01	0.00	0.03	0.20							
12 Investment in innovation	0.90	0.30	0.06	0.15	0.10	0.09	-0.07	0.00	0.12	0.13	-0.07	0.11	0.01						
13 Training intensity	1.02	1.66	0.06	0.04	0.06	0.04	-0.03	-0.05	0.12	0.23	-0.02	0.03	0.03	0.11					
14 Patent possession	0.50	0.50	0.23	0.24	0.31	0.35	0.09	-0.10	0.30	0.21	-0.13	0.13	-0.01	0.22	0.09				
15 IP violation	0.34	0.47	0.09	0.12	0.09	0.17	0.10	-0.01	0.05	0.04	-0.11	0.17	-0.02	0.16	-0.01	0.34			
16 Export intensity	0.31	0.27	0.07	0.10	0.10	0.32	0.15	-0.10	0.33	0.13	-0.05	0.03	0.07	0.18	0.11	0.42	0.26		
17 Family firm	0.64	0.48	-0.16	-0.14	-0.20	-0.13	0.19	-0.04	-0.28	-0.26	-0.08	0.10	0.05	-0.02	-0.09	-0.06	0.12	-0.01	

^aAll correlations above |0.08| are significant at 5% or lower

TABLE 5.2**Share of Firms with Innovation Activity Opened***

Innovation Activity	Overall <i>(n = 508)</i>	Family Firms <i>(n = 325)</i>	Non-Family Firms <i>(n = 183)</i>
Idea generation	0.77	0.75	0.80
Research and development (R&D)	0.76	0.73	0.83
Design	0.55	0.51	0.63
Testing and preparation for sale	0.69	0.66	0.74
Market launch	0.57	0.53	0.63

* On average each firm cooperated in 3.34 different innovation stages.

TABLE 5.3**Share of Firms with Open Innovation Partner Type***

Partner Type	Overall <i>(n = 508)</i>	Family Firms <i>(n = 325)</i>	Non-Family Firms <i>(n = 183)</i>
Customer	0.76	0.74	0.80
Corporate client	0.24	0.21	0.28
Supplier	0.59	0.61	0.57
Service firm	0.33	0.31	0.37
Competitor	0.23	0.17	0.34
University/research institute	0.43	0.39	0.51

* On average each firm collaborates with 2.59 different partner types for innovation-related activities.

TABLE 5.4**Industry Distribution of Firms**

Industry	Nace Codes	Total Firms	Family Firms	Non-Family Firms	Share Family Firms
Food/tobacco	10-12	23	16	7	0.70
Textiles	13-15	28	20	8	0.71
Wood/paper	16-17	26	24	2	0.92
Chemicals	20-21	53	31	22	0.58
Rubber/plastics	22	32	24	8	0.75
Glas/ceramic goods	23	21	15	6	0.71
Metals	24-25	77	54	23	0.70
Machinery/equipment	28, 33	80	55	25	0.69
Electrical/optical equipment	26-27	99	55	44	0.56
Transport equipment	29-30	19	7	12	0.37
Furniture	31-32	24	14	10	0.58
Energy/mining	5-9, 19, 35	26	10	16	0.38
Total		508	325	183	0.64

TABLE 5.5
Ordered Logistic Regression Analyses for Innovation Openness

Dependent variables	Range of open innovation activities				Range of open innovation partner types			
	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>		<i>Model 4</i>	
Independent Variables	Coef.	Robust S.E.	Coef.	Robust S.E.	Coef.	Robust S.E.	Coef.	Robust S.E.
Firm size	0.189 **	0.085	0.163 *	0.087	0.158 *	0.081	0.133	0.083
Firm age	-0.081	0.092	-0.044	0.096	-0.138	0.102	-0.098	0.103
Part of a national group	-0.052	0.268	-0.086	0.271	0.105	0.261	0.038	0.267
Part of an international group	-0.265	0.227	-0.361	0.230	-0.082	0.215	-0.183	0.220
Human Capital	0.017 ***	0.006	0.014 **	0.006	0.010	0.006	0.007	0.006
Product diversification	0.001	0.003	0.001	0.003	0.001	0.003	0.001	0.003
Competition: New product development	-0.106	0.099	-0.092	0.098	0.134	0.098	0.146	0.099
Competition: Quality	0.218 *	0.122	0.231 *	0.123	0.026	0.106	0.038	0.107
Investment in innovation	0.497	0.309	0.518 *	0.313	-0.001	0.282	0.003	0.284
Training intensity	-0.005	0.053	-0.006	0.053	0.019	0.056	0.016	0.057
Patent possession	0.580 ***	0.196	0.588 ***	0.195	0.745 ***	0.198	0.751 ***	0.198
IP violation	0.215	0.188	0.270	0.190	0.199	0.190	0.283	0.200
Export intensity	-0.133	0.352	-0.073	0.355	-0.317	0.364	-0.300	0.360
Family firm			-0.450 **	0.203			-0.468 **	0.202
Number of observations	508		508		508		508	
Log pseudolikelihood	-814.54		-811.82		-847.18		-844.18	
Chi Square	58.94 ***		63.70 ***		50.84 ***		56.44 ***	
Chi-square change			5.44 **				6.00 **	

* p ≤ .10; ** p ≤ .05; *** p ≤ .01

Note: Industry dummies are included in all regressions

TABLE 5.6
Tobit Regressions Analyses for Reliance on Formal Contract

Dependent variable	Reliance on formal contract			
	<i>Model 5</i>		<i>Model 6</i>	
	Coef.	Robust S.E.	Coef.	Robust S.E.
Independent variables				
Firm size	0.126 ***	0.037	0.112 ***	0.038
Firm age	-0.053	0.045	-0.034	0.046
Part of a national group	0.066	0.110	0.054	0.107
Part of an international group	-0.043	0.110	-0.077	0.110
Human Capital	0.007 **	0.003	0.005 ***	0.003
Product diversification	-0.002	0.002	-0.002	0.002
Competition: New product development	0.046	0.050	0.051	0.049
Competition: Quality	-0.085 *	0.048	-0.080 *	0.048
Innovation expenditure	0.088	0.160	0.091	0.159
Training intensity	-0.010	0.022	-0.009	0.022
Patent Possession	0.374 ***	0.097	0.381 ***	0.096
IP violation	-0.036	0.090	-0.003	0.091
Export intensity	-0.201	0.180	-0.190	0.178
Collaboration with Customer	-0.247 *	0.137	-0.257 *	0.136
Collaboration with Client	-0.215 **	0.098	-0.230 **	0.096
Collaboration with Supplier	-0.224 **	0.089	-0.205 ***	0.089
Collaboration with Service Firm	0.264 ***	0.085	0.258 ***	0.084
Collaboration with Competitor	-0.141	0.087	-0.174 **	0.088
Collaboration with University	0.352 ***	0.085	0.355 ***	0.085
Family firm			-0.210 **	0.095
Number of observations	399		399	
Log pseudolikelihood	-427.27		-424.75	
F	4.73 ***		4.77 ***	
Log likelihood ratio test			5.04 **	

* $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Industry dummies are included in all regressions

5.5. ADDITIONAL ANALYSES AND ROBUSTNESS CHECKS

To test the robustness of our findings, we conducted some additional analyses³³. First, we checked and controlled for a potential selection bias which might have been introduced by excluding firms that neither had any innovations in the past, nor planned any in the future. All three hypothesized effects are robust to adding the Inverse Mills Ratio of the probability of being an innovating firm. Second, we tested whether the results change for Hypotheses 1b, if the related open innovation partner categories customers and clients are combined into one group. The findings remain consistent with this alternative specification. Finally, we

³³ The results of the additional analysis are not reported here for brevity. They are available upon request from the first author.

performed subsample regressions ($n = 290$ for Hypothesis 1a and b; $n = 221$ for Hypothesis 2) excluding firms that are part of a national or international group, because the independence in strategic decision-making of these firms might be restricted. The findings are qualitatively consistent in these subsample regressions.

5.6. DISCUSSION AND CONCLUSIONS

5.6.1. Main Findings and Academic Contributions

The research question that sparked this study was how family control and the associated concern for socioemotional wealth issues lead to differences in open innovation practices between FFs and NFFs. This analysis sheds further light on how dominant owner coalitions with their particularistic agendas may shape strategic decisions and behaviors in such a way that can be difficult to explain based on economic grounds only. The pursuit of idiosyncratic sets of mixed objectives, some economic and some non-economic, can be said to be a main distinguishing feature of FFs (Berrone, Cruz and Gómez-Mejía, 2012; Chrisman and Patel, 2012), and it is in this area that family business research has the greatest potential for contributing to the mainstream management literature. As stated by Gedajlovic and colleagues (2012: p. 1027), “family firms offer strategy and entrepreneurship scholars an opportune context in which to develop and test their theories of how executives manage the trade-offs between multiple and mixed goals and also how they identify, evaluate and marshal resources to exploit opportunities in pursuit of those goals”. Our study advances this research stream by exploring the interrelationship between family control and the important strategic domain of open innovation.

The empirical findings of this study offer support for our derived hypotheses. Specifically, we find that FFs tend to be less engaged in open innovation in terms of the range of innovation activities being opened for external collaboration and the number of innovation partner types being used. This corroborates the idea that the idiosyncratic nature of FFs’ goals restricts their collaboration opportunity set and directs them toward partnerships with particular innovation partner types during particular activities of the innovation process. Indeed, the wider the range of innovation activities being opened and partner types being used, the greater the likelihood for conflicting interest (Almirall and Casadesus-Masanell, 2010). This accords with the general notion that FFs are reluctant to give up control and prefer to maintain discretion over decision-making to a greater extent than their non-family counterparts (Gómez-Mejía et al., 2007; Gómez-Mejía et al., 2011). The empirical findings also reveal that FFs make less use of contracting in the governance of their innovation collaborations. This supports the idea that FFs’ combining of economic and socioemotional objectives adds to their transactional complexity, thereby making their partnerships less susceptible to formal contracting. It thus appears that FFs tend to prefer more relational bonds (Miller, Le Breton-Miller and Scholnick, 2008) characterized by tacit understandings and greater flexibility.

In terms of theoretical implications, this study contributes to a growing body of research on the distinctiveness of FFs as an organizational form. The central idea that drives

family business research is that family involvement has a non-trivial influence on the strategic behavior of firms, in large part because of their socioemotional family-centered considerations (Berrone et al., 2010; Gómez-Mejía et al., 2007; Gómez-Mejía et al., 2011; Schulze et al., 2001). So far, relatively little empirical research had been conducted on innovation-relevant behaviors in FFs, and those few studies addressing this issue mainly focused on R&D spending (e.g., Chrisman and Patel, 2012; Munoz-Bullón and Sanchez-Bueno, 2011). By theorizing about FFs' idiosyncratic set of mixed motives and testing its implications for their open innovation practices, our study deepens insight on the topic of innovation in a FF setting and, more generally, into the distinctiveness of this organizational form. Furthermore, this study contributes to the open innovation literature which has been criticized for suffering from an optimistic bias in emphasizing the benefits of openness while underresearching potential threats and difficulties (Dahlander and Gann, 2010; Lichtenthaler, 2011). Our study clarifies how a dominant owner's particularistic pursuit of socioemotional objectives may increase the divergence of interests problem of open innovation, thereby lowering the firm's willingness to give up control over the innovation process. While such socioemotional considerations tend to be "anchored at a deep psychological level among family owners" (Berrone et al., 2010: p. 87), they are not unique to this organizational form. That is, non-family principals may also, to some extent, combine economic aspirations with particular non-economic considerations (Chrisman et al., 2012; Gedajlovic et al., 2012). As such, moving beyond economic instrumentality in our modeling of open innovation may help explain why some organizations are less inclined than others to open their innovation process.

5.6.2. Limitations, Suggestions for Future Research and Practical Implications

This study is not without its limitations, which provide opportunities for future research. First, our study did not include a direct measure of the firms' goals and objectives. Similar to prior empirical work (for an overview, see Gómez-Mejía et al., 2011), we used a measure of family control to approximate the prevalence of socioemotional considerations in decision-making. As indicated by Berrone, Cruz, and Gómez-Mejía (2012), the next step in this line of inquiry will be to include a measure of the different dimensions of the socioemotional wealth construct, and to assess how it is combined with traditional economic objectives. Second, this study did not evaluate the impact of FFs' open innovation practices on subsequent innovation outputs and financial performance. For instance, recent work suggests that the managerial and relational complexities related to open innovation may also have detrimental performance implications (Belderbos et al., 2010; Faems et al., 2010). We therefore encourage future research to examine how FFs' limited use of open innovation and contractual governance influence their performance from an economic point of view, and thus to what extent these practices affect their competitive position. This taps into the broader issue of how socioemotional aspirations and economic performance interrelate. To date, the performance implications of family involvement are still unclear (Miller, Minichilli and Corbetta, 2013) and more research is needed to clarify in which domains and under which circumstances the pursuit of socioemotional objectives comes at the expense of economic performance and when synergies may occur (Gedajlovic et al., 2012). Another limitation is that our theoretical

framework does not consider how family firms deal with different activities and partners separately rather than in aggregate. Future studies may address this remaining void by developing theory about which the types of partners FFs are more or less likely to collaborate with individually and why. Lastly, future research should explore in greater depth how FFs build, organize and maintain their networks of contacts. Some scholars indeed suggest that, compared to NFFs, FFs prefer more enduring networks of close and trusted partners (e.g., Miller, Le Breton-Miller and Scholnick, 2008). Yet, insight into the processes and criteria used by FFs in their network activities, and into the relational and structural configurations of these networks, remains underdeveloped and requires more systematic research.

This article also has some important practical implications. First, although this line of inquiry is still in its infancy, research does seem to suggest that FFs have disadvantages regarding those aspects of innovation that require the inclusion of influential outsiders. Specifically, family involvement appears to be negatively associated with R&D investments and open innovation, which can be explained by families' reluctance to include external parties such as professional managers, capital providers and innovation partners (see Chrisman and Patel, 2012; Classen et al., 2012; Gómez-Mejía et al., 2011). FF decision-makers need to be aware that their reluctance to give up control because of socioemotional wealth concerns may potentially harm the firm's innovative performance, and thus its robustness in the long run. To safeguard the competitiveness of their organization, this would imply that they need to compensate in other innovation domains, for instance, by means of stimulating employee creativity and creating an innovation-supportive organizational culture (Bammens, Van Gils and Voordeckers, 2010). Second, nowadays most policy-makers have innovation high on the agenda. Insights from this study may prove instrumental for these policy-makers and associations alike in designing and implementing initiatives aimed at spurring innovation in the business community. In order to be effective also among the large group of FFs, these programs will need to consider the peculiarities of this organizational form; our study suggests, for instance, that open innovation initiatives may be most effective among FFs when the focus is on personal contact allowing for the building of relational partnerships and on matching (economic and non-economic) interests, in addition to the complementarity of innovation-relevant resources.

5.6.3. Concluding Note

This study has indicated that ownership structure and owner preferences have a significant bearing on how a firm organizes its innovation activities. We have developed and tested the idea that family control, and the associated pursuit of an idiosyncratic mix of motives, affects both a firm's willingness to open the innovation process to external partners as well as its governance of the innovation partnerships it enters. In doing so, our study has highlighted some of the challenges FFs face with regards to the growing trend toward open systems of innovation. Further, our study has underlined the value of incorporating non-economic considerations in models of open innovation. It is our hope that this study will promote further research on the advantages and challenges that family decision-makers face when managing the organizational innovation process.

6. DISCUSSION AND CONCLUSION

6.1. INTRODUCTION

The purpose of this dissertation was to advance the understanding of differences between the innovation processes of family and non-family enterprises. Each of the chapters investigates a particular aspect of this research endeavor by looking at specific sub-questions either relating to internal or external aspects of the innovation process. This concluding chapter summarizes the main findings of the PhD project, it discusses the main implications for research and practice and finally, it reflects on the limitations and potential future research avenues.

6.2. SUMMARY OF MAIN FINDINGS

Findings Chapter 2. This chapter provided an exploratory analysis of differences between family and non-family firms in innovation investment, product and process innovation outcomes and labor productivity. Using data from the Community Innovation Survey (CIS) on 2,087 German small- and medium-sized enterprises (SMEs), the analysis showed significant disparities at each stage of the innovation process. Whereas family SMEs had a higher propensity to invest in innovation at all, conditional on investing in innovation, these companies did so less intensively than their non-family counterparts. Family SMEs further tended to outperform non-family SMEs in terms of process innovation outcomes when controlling for innovation investment. Given the level of product and process innovation, however, family SMEs underperformed regarding labor productivity in comparison to non-family SMEs. The findings generally complement previous empirical research by illustrating how the presence of a dominant family relates to innovation inputs and outputs of SMEs in Europe's largest economy and its innovative SME sector.

Findings Chapter 3. In the third chapter of this dissertation, we predicted that family start-ups and start-ups performing below aspiration have distinct reference foci which influence their level of research and development (R&D) investment intensity. Longitudinal data from the Kauffman Firm Survey (KFS) on 912 U.S. start-ups provided empirical evidence for our theoretical framework based on the behavioral theory of the firm suggesting that reference points influence the level of organizational risk taking. The analysis showed that family start-ups in which at least two members of the same family own the majority stake invested less into the R&D of new products and services compared to non-family start-ups. Whereas performance below aspiration generally increased start-ups' subsequent R&D investment, this link was negatively moderated by family start-up status such that family start-ups increased their R&D expenditures to a lesser extent after performance below aspiration.

Findings Chapter 4. This chapter examined differences in the diversity of cooperation partners used for innovation-related activities (i.e., search breadth) between family and non-family SMEs, as well as within the group of family SMEs. The results from a sample of 167 Dutch and Belgian manufacturing firms generally confirmed the hypotheses derived from the behavioral theory of the firm. Specifically, they showed that family SMEs have a lower search breadth than their non-family counterparts. The findings further illustrated that CEO

university education and non-family management involvement in the top management team relate positively to the search breadth of family SMEs. Finally, we observed a positive interaction effect between educational background diversity and the level of non-family management involvement on the search breadth of family SMEs.

Findings Chapter 5. In this chapter we developed and tested the idea that the idiosyncratic mix of goals, some economic and some non-economic, being pursued by family-controlled firms affects their engagement in, and governance of, open innovation. Specifically, we proposed that – in comparison to non-family firms – the range of innovation activities being opened for external collaboration and the number of innovation partner types being used were more restricted among family-controlled firms, and that these firms relied to a lesser extent on formal contracting as a governance tool in their innovation partnerships. Analyses using data from the Mannheim Innovation Panel on the open innovation practices of German manufacturing firms offered empirical support for our hypotheses.

6.3. IMPLICATIONS FOR THEORY AND PRACTICE

The central findings of this dissertation have a number of relevant implications for researchers and practitioners interested in the characteristics of innovation in family businesses. From a scientific perspective, this thesis complements prior research on innovation in family firms by focusing primarily on SMEs and start-ups instead of large corporations. It further contributes to the literature by comparing, next to the internal innovation investments in family versus non-family businesses, also the product and product innovation outcomes, as well as the level of labor productivity. The thesis also provides new insights on the use of external innovation partnerships and the preferred governance mechanisms in these partnerships by the two types of firms. Collectively, the thesis improves the understanding of differences between innovation processes in family and non-family enterprises.

From a theoretical viewpoint, our research contributes to the literature on innovation in small enterprises. Prior studies have shown several peculiarities which differentiate it from innovation in large companies (e.g., Tan et al. 2009; Tether 1998). Yet, scholarly research has thus far focused in particular on large companies and only to a lesser extent on small firms (Verhees and Meulenberg 2004). The findings of this PhD thesis also advance the theory of family-oriented particularistic goals and behaviors of firms with family involvement (Chrisman et al., 2013; De Massis et al., forthcoming; Zellweger et al., 2011). Focusing on the innovation process of enterprises, it sheds new light on how and why family businesses display particularistic behaviors and produce dissimilar performance outcomes compared to non-family firms. By indicating how family firms try to balance the objectives of continuous SEW and economic performance, the studies of this dissertation also underline the important role of non-economic goals in family firms' decision making (Chrisman et al., 2012).

The core findings of the four quantitative empirical chapters in this dissertation suggest that some of the behavioral dynamics that influence the strategic behavior of established family firms are also at play in small and young family enterprises. These mainly refer to the need to balance economic and non-economic objectives (Chrisman et al., 2012) and the notion that family firms are primarily concerned with the preservation of

socioemotional benefits for the family when making strategic decisions (Berrone et al., 2010; Gómez-Mejía et al., 2007; Gómez-Mejía et al., 2010). While previous research has illustrated how this distinct reference point in family businesses limits the level of innovation investment intensity (Block, 2012; Chrisman and Patel, 2012; Munari et al., 2010), our findings show that family SMEs in Germany appear to be aware of the necessity to invest at least some resources into the development of new products, services and production processes. Their loss aversion with respect to socioemotional benefits nonetheless appears to limit their willingness to invest intensively into innovation. Similarly, we observe that family start-ups invest less intensively into R&D than their non-family counterparts and encountering underperformance they intensify their R&D investment to a lower extent. We infer that underperforming family start-ups are less exposed to institutional pressures than large family firms which tend to adjust their R&D intensity to industry standards when performing below aspiration (Chrisman and Patel, 2012).

Another central implication is that family SMEs are able to match the product innovation outcomes of their non-family counterparts and they even outperform them regarding the ability to manage process innovation. This is in line with prior studies suggesting that family firms possess distinctive capabilities and resources (e.g., social capital configurations) that may contribute to their innovation success (Eddleston et al., 2008; Sirmon and Hitt, 2003). Moreover, it shows that ignoring the level of process innovation outcomes might be misleading when comparing innovation processes in family and non-family firms. Obviously, product innovations are only one form of innovation output that innovation investments are targeted at and it seems that family businesses emphasize those innovation endeavors targeted at process innovation. The observed positive indirect effect of family SME status on labor productivity via innovation output may compensate for the negative direct effect. Hence, this dissertation suggests also that neglecting potential interdependencies or indirect effects in the innovation process may lead to simplified interpretations and biased policy implications.

Finally, it is noteworthy that this dissertation not only displays significant differences regarding the internal aspects of the innovation process, but also regarding the use of external innovation sources in family and non-family firms. Specifically, family businesses invest less intensively in innovation and they also have a less diversified set of external innovation partners. The limited degree to which family firms open up their innovation processes to external partnerships emphasizes the pursuit of another important socioemotional objective for the family, namely maintaining discretion and authority over the innovation process.

There are also a number of implications for managers and policy-makers that derive from the findings of this thesis. First, the fact that two separate and independent studies observe the tendency of family firms to invest less intensively into innovation is striking and it indicates that not only large family corporations but also family SME and family start-ups invest less intensively into innovation than their non-family counterparts. Lower innovation investment intensities in small and entrepreneurial family enterprises may cause a disadvantage for these firms regarding their cumulative learning and their ability to use externally located resources in the long-run (Classen et al., 2012). An awareness of this

propensity might hence enable managers to develop counter strategies improving the absorptive capacity of their family firm in the long-run.

A second managerial implication derives from the openness of family businesses during their innovation processes. It seems as if family enterprises have disadvantages regarding those aspects of innovation that require the inclusion of influential outsiders. Decision-makers in family firms should be aware of their reluctance to give up discretion over their innovation processes. Our findings suggest that they might be able to open up the innovation process by means of recruiting a highly educated CEO or a higher percentage of external managers. Hence potential initiatives may be targeted at these two features. In other words, the professionalization of family firms may be the key to balance economic interests (e.g., better access to complementary resources) and non-economic interests (e.g., SEW preservation) in a more effective way. Moreover, initiatives focusing on personal contact, building of relational partnerships and on matching economic and noneconomic interests might be more promising than considering only the complementarity of innovation-relevant resources.

Considering the neutral and positive findings on product and process innovation, it seems that family firms are nonetheless able to safeguard their competitiveness, despite their lower innovation investment intensity and their lower openness towards external innovation partners. This implies that they may in fact successfully compensate in other innovation domains, for instance, by means of creating an innovation-supportive organizational culture and stimulating employee creativity (Bammens et al., 2010). Hence, for policy-makers it is vital to discard the view of family firms as a form of business that fails to innovate (Morck and Yeung, 2003).

6.4. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

There are several limitations that restrict the conclusions that can be drawn from the studies reported in this dissertation. The first limitation concerns data limitations regarding the exact nature of family involvement in a firm. Whereas the primary dataset used in *Chapter 4* contains extensive information about the exact mode in which families can influence strategic decisions within a firm, the Mannheim Innovation Panel (MIP) and the Kauffman Firm Survey (KFS) used in *Chapters 2, 3 and 5* comprise less precise information on this matter. Although the majority ownership criterion used in these studies is generally associated with the ability to exert control over the business, the level of discretion in decision-making may also depend on the degree of family involvement in the management team or the supervisory board. Likewise, the generation that governs the company may also alter the relationships between family firm status and various aspects of the innovation process. As only one chapter investigates potential sources of family firm heterogeneity, additional research is recommended using more fine-grained measures of family involvement.

Second, while the MIP and the KFS datasets comprise longitudinal data, the variable to identify family firm status was only included in a single wave of each respective survey. This limits the opportunity to conduct panel data analyses. In particular fixed-effects estimations requiring variables to be time-variant are unfeasible. As a consequence, some of

the analyses in this dissertation may suffer from unobserved heterogeneity or omitted variable biases influencing the independent as well as the dependent variable.

Third, the four studies included in this thesis are based on evidence collected from a specific geographical region, i.e. Germany, Belgium/The Netherlands and US. In how far these findings are generalizable to other regions, remains to be explored in future research. Countries are heterogeneous in terms of the type and frequency of innovation and cultural differences (e.g., degree of risk avoidance) may influence the innovation process of family firms globally. Such an institutional perspective may add further insights on how the effect of family involvement on innovation varies across regional contexts.

Fourth, we do not measure the desire to preserve SEW to which we attribute the differences between family and non-family business innovation. Similar to prior empirical work (for an overview, see Gómez-Mejía et al., 2011), we instead use measures of family control to approximate the prevalence of SEW considerations in decision-making. Future studies may incorporate a proxy of the different dimensions of the SEW construct in the analyses (Berrone et al., 2012). This would allow for an assessment how the non-economic objectives existing in family firms are combined with the traditional economic objectives.

Fifth, our investigation of external innovation processes focuses on the range of open innovation partner types and open innovation activities. We neither incorporated information about the number of partners from the same type of source nor about the intensity of these relationships. It might be the case that family firms compensate for a lack of partnership diversity by a repeated use of a single type of innovation partner. Future studies may investigate the diversity, together with the intensity of partnerships, of family and non-family SMEs to see the interplay between these two dimensions. Scholars may also examine whether family firms prefer strategic over tactical cooperation agreements and to which degree their innovation-related collaboration entails equity investments.

Finally, this thesis did not study the impact of open innovation practices on subsequent innovation outputs in family versus non-family firms. This research topic may also benefit from further research examining whether family firms reach the tipping point (Laursen and Salter, 2006) after which the use of an additional source actually decreases innovative performance earlier than non-family firms. In other words, future research may examine how the limited use of open innovation and contractual governance influence the innovation performance of family firms.

6.5. CONCLUDING REMARKS

Despite the above limitations, the research presented in this dissertation contributes to the literature primarily by shedding new light on previously neglected differences between innovation in family and non-family businesses. A better understanding of the idiosyncratic innovation processes in family businesses is essential given their numerical and economic significance. Throughout this thesis, I have taken the perspective that family firms consider economic and non-economic objectives when organizing their innovation processes. The findings of the studies support this view and suggest that the presence of a dominant family has a substantial influence on the innovation process of an organization.

NEDERLANDSE SAMENVATING

Familiebedrijven zijn de oudste en meest voorkomende bedrijfsvorm in de wereld. Door hun alom aanwezigheid zullen familiebedrijven een centrale rol spelen bij het genereren van innovaties in de 21e eeuw. Familiebedrijven worden vaak geassocieerd met een reeks kenmerken die zowel voordelig als nadelig kunnen zijn voor de innovatiekracht van een bedrijf. Aan de ene kant beschikken familiebedrijven over een unieke bundel van middelen die duidelijke voordelen kunnen opleveren voor het innovatieproces. Lange termijn oriëntatie, ‘stewardship’ gedrag en informele kennisdeling zijn kenmerken van familiebedrijven die leren, delen van kennis en innovatie kunnen stimuleren. Aan de andere kant worden familiebedrijven ook vaak geassocieerd met conservatisme en risicomijdend strategisch gedrag die de mate van innovatie mogelijk negatief beïnvloeden. Het doel van dit proefschrift is om de kennis betreffende interne en externe innovatie activiteiten in familiebedrijven te verbeteren. De overkoepelende onderzoeksvraag kan dus als volgt worden geformuleerd: Hoe verschillen interne innovatieprocessen en het gebruik van externe innovatiebronnen tussen familiebedrijven en niet-familiebedrijven?

De meerderheid van de empirische studies die discrepanties tussen de innovatieprocessen van familiebedrijven en niet-familiebedrijven onderzoeken richten zich op onderzoek en ontwikkelings (O&O) investeringen in grote en beursgenoteerde ondernemingen. Uit deze stroom van onderzoek blijkt dat familiebedrijven minder intensief investeren in O&O dan niet-familiebedrijven. Bovendien vergelijkt geen voorafgaande studie de innovatie investeringsintensiteit van familiale en niet-familiale midden- en kleinbedrijven (MKB). Ook hebben de innovatie investeringen van nieuwe familie en niet-familie ondernemingen geen aandacht in de literatuur ontvangen. Onderzoek naar deze groepen ondernemingen is belangrijk gezien de voordelen van innovatie voor kleine en jonge bedrijven en hun essentiële bijdrage tot het innovatiepotentieel van een economie. Daarnaast zijn bevindingen uit het onderzoek op grote en publieke familiebedrijven niet gemakkelijk overdraagbaar op kleine en jonge familie bedrijven.

Voorafgaande studies hebben eveneens mogelijke verschillen tussen het niveau van de procesinnovatie in de familie versus niet-familiebedrijven genegeerd. Toch is het essentieel om niet alleen product-, maar ook processinnovatie te overwegen, omdat bedrijven die innovatieve strategieën benadrukken één van beide types innovatie kunnen navolgen. Tenslotte zijn externe aspecten van het innovatieproces, zoals de kenmerken van het innovatiepartner netwerk of de governance mechanismen die gebruikt worden in innovatie samenwerkingsverbanden, niet onderzocht voorafgaand aan dit proefschrift. Dit heeft geleid tot een onvolledige kennis over innovatie in familiebedrijven. Daarom is dit proefschrift erop gericht om de stroom van empirisch onderzoek uit te breiden door het onderzoeken van interne en externe elementen van het innovatieproces voornamelijk in kleinere, private familie en niet- familiebedrijven.

Vanuit een theoretisch oogpunt suggereren de kern bevindingen van de vier empirische hoofdstukken in dit proefschrift dat sommige eigenschappen die van invloed zijn op het strategische gedrag van de gevestigde familiebedrijven ook in kleine en jonge familiebedrijven bestaan. Deze hebben voornamelijk betrekking op de noodzaak om de

economische en niet-economische doelstellingen te beschouwen en de notie dat familiebedrijven bij het maken van strategische beslissingen voornamelijk bezig zijn met het behoud van de sociaal-emotionele voordelen voor de familie. Terwijl het vorige onderzoek heeft aangetoond hoe in familiebedrijven dit referentiepunt de mate van innovatie intensiteit van de investeringen duidelijk beperkt, blijkt uit onze bevindingen dat de families in Duitse MKBs zich bewust lijken te zijn van de noodzaak om op zijn minst enige middelen te investeren in de ontwikkeling van nieuwe producten, diensten en productieprocessen. De aversie tegen het verlies ten aanzien van sociaal-emotionele voordelen lijkt niettemin hun bereidheid om intensief te investeren in innovatie te beperken. Ook zien we dat jonge familiebedrijven minder intensief investeren in O&O dan jonge niet-familiebedrijven en dat zij na 'underperformance' hun O&O-investeringen in mindere mate intensiveren. We concluderen dat slecht presterende jonge familiebedrijven minder zijn blootgesteld aan institutionele druk dan grote familiebedrijven die de neiging hebben om hun O&O-intensiteit aan de industrie normen aan te passen.

Een andere centrale implicatie is dat de familie MKB in staat zijn om de productinnovatie uitkomsten van niet-familie MKB te evenaren en zelfs te overtreffen met betrekking tot de mogelijkheid om procesinnovatie te bereiken. Dit is in lijn met eerdere studies die suggereren dat familiebedrijven onderscheidende mogelijkheden en middelen bezitten (b.v., sociaal kapitaal configuraties) die kunnen bijdragen aan hun innovatiesucces. Bovendien laat het zien dat het negeren van procesinnovatie uitkomsten misleidend kan zijn bij het vergelijken van innovatieprocessen in de familie en niet-familiebedrijven. Uiteraard zijn productinnovaties slechts één vorm van innovatie output waar innovatie-investeringen gericht op zijn en het lijkt erop dat familiebedrijven procesinnovatie benadrukken. Het waargenomen positieve indirecte effect van familiale MKB-status op de arbeidsproductiviteit via innovatie output kan compenseren voor de negatieve rechtstreekse werking. Vandaar suggereert dit proefschrift dat het negeren van mogelijke indirecte effecten in het innovatieproces kan leiden tot vereenvoudigde interpretaties en beleidsimplicaties.

Tenslotte is het opmerkelijk dat dit proefschrift niet alleen significante verschillen toont met betrekking tot de interne aspecten van het innovatieproces, maar ook met betrekking tot het gebruik van externe innovatie bronnen in familie en niet-familiebedrijven. Meer in het bijzonder, investeren familiebedrijven niet alleen minder intensief in innovatie, maar ze hebben ook een minder gediversifieerde reeks van externe innovatie partners. De beperkte mate waarin familiebedrijven hun innovatieprocessen voor externe partnerschappen openen benadrukt het nastreven van een andere belangrijke sociaal-emotionele doelstelling voor een familie, namelijk het handhaven van discretie en gezag over het innovatieproces.

Gezien de neutrale en positieve bevindingen over product- en procesinnovatie, lijkt het erop dat familiebedrijven in staat zijn hun concurrentievermogen veilig te stellen, ondanks hun lagere innovatie-intensiteit en hun lagere openheid naar externe innovatie partners. Dit betekent in feite dat zij in andere innovatie domeinen succesvol compenseren, bijvoorbeeld door het creëren van een innovatie-ondersteunende organisatiecultuur en het stimuleren van creativiteit onder medewerkers. Vandaar is het voor beleidsmakers belangrijk om de mening dat familiebedrijven een vorm van business zijn die er niet in slaagt om te innoveren te herzien.

BIBLIOGRAPHY

- Acs, Z. J., and Armington, C. (2004). Employment growth and entrepreneurial activity in cities. *Regional Studies* 38(8), 911–927.
- Alexiev, A. S., Jansen, J. J. P., Van den Bosch, F. A. J., and Volberda, H. W. (2010). Top management team advice seeking and exploratory innovation: The moderating role of TMT heterogeneity. *Journal of Management Studies* 47(7), 151–177.
- Almirall, E., and Casadesus-Masanell, R. (2010). Open versus closed innovation: A model of discovery and divergence. *Academy of Management Review* 35(1), 27–47.
- Ancona, D. G., and Caldwell, D. F. (1992). Demography and design: Predictors of new product team performance. *Organization Science* 3(3), 321–341.
- Anderson, R. C. and Reeb, D. M. (2003). Founding-family ownership and firm performance: Evidence from the S&P 500. *The Journal of Finance* 58(3), 1301–1327.
- Ang, J. S., Cole, R. A., and Lin, J. W. (2000). Agency costs and ownership structure. *Journal of Finance* 55(1), 81–106.
- Aronoff, C. E., Astrachan, J. H., Mendosa, D. S., and Ward, J. L. (1997). *Making Sibling Teams Work: The Next Generation*. Marietta, GA: Family Enterprise.
- Arregle, J.-L., Hitt, M. A., Sirmon, D. G., and Very, P. (2007). The development of organizational social capital: Attributes of family firms. *Journal of Management Studies* 44(1), 73–95.
- Astrachan, J. H., and Shanker, M. C. (1996). Myths and realities: Family businesses' contribution to the US economy - A framework for assessing family business statistics. *Family Business Review* 9(2), 107–119.
- Atuahene-Gima, K. (1996). Market orientation and innovation. *Journal of Business Research* 35(2), 93–103.
- Audia, P. G., and Greve, H. R. (2006). Less likely to fail? Low performance, firm size, and factory expansion in the shipbuilding industry. *Management Science* 52(1), 83–94.
- Audretsch, D. B. (2002). The dynamic role of small firms: Evidence from the United States. *Small Business Economics* 18(1–3), 13–40.
- Ayyagari, M., Demirgüç-Kunt, A., and Vojislav, M. (2011). Firm innovation in emerging markets: The role of finance, governance, and competition. *Journal of Financial and Quantitative Analysis* 46(6), 1545–1580.
- Bammens, Y., Van Gils, A., and Voordeckers, W. (2010). The role of family involvement in fostering an innovation-supportive stewardship culture. *Academy of Management Best Paper Proceedings*. Annual Meeting of the Academy of Management, Montreal.
- Bammens, Y., Voordeckers, W., and Van Gils, A. (2011). Boards of directors in family businesses: A literature review and research agenda. *International Journal of Management Reviews* 13(2), 134–152.

- Bantel, K. A., and Jackson, S. E. (1989). Top management innovations in banking: Does the composition of the top team make a difference?. *Strategic Management Journal* 10(1), 107–124.
- Barbera, F., and Moores, K. (2013). Firm ownership and productivity: A study of family and non-family SMEs. *Small Business Economics* 40(4), 953–976.
- Barker III, V. L., and Mueller, G. C. (2002). CEO characteristics and firm R&D spending. *Management Science* 48(6), 782–801.
- Barry, F. (2005). FDI, transfer pricing and the measurement of R&D intensity. *Research Policy* 34(5), 673–681.
- Barth, E., Gulbrandsen, T., and Schone, P. (2005). Family ownership and productivity: The role of owner-management. *Journal of Corporate Finance* 11(1–2), 107–127.
- Baumol, W. J. (2002). *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism*. Princeton, NJ: Princeton University Press.
- Becker, M. H. (1970a). Sociometric location and innovativeness: Reformulation and extension of the diffusion model. *American Sociological Review* 35(2), 267–304.
- Becker, M. H. (1970b). Factors affecting diffusion of innovations among health professionals. *American Journal of Public Health* 60(2), 294–304.
- Beehr, T. A., Drexler, J. A. Jr., and Faulkner, S. (1997). Working in small family businesses: Empirical comparisons to non-family businesses. *Journal of Organizational Behavior* 18(3), 297–312.
- Belderbos, R., Carree, M., and Lokshin, B. (2006). Complementarity in R&D cooperation strategies. *Review of Industrial Organization* 28(4), 401–426.
- Belderbos, R., Faems, D., Leten B., and Van Looy, B. (2010). Technological activities and their impact on the financial performance of the firm: Exploitation and exploration within and between firms. *Journal of Product Innovation Management* 27(6), 869–882.
- Belenzon, S., and Zarutskie, R. (2012). Married to the firm? Family ownership, performance and financing in private firms. Available at SSRN: <http://ssrn.com/abstract=1710321>.
- Benavides-Velasco, C., Quintana-García, C., and Guzmán-Parra, V. (2013). Trends in family business research. *Small Business Economics* 40(1), 41–57.
- Bennedsen, M., Nielson, K. M., Pérez-González, F., and Wolfenzon, D. (2007). Inside the family firm: The role of families in succession decisions and performance. *Quarterly Journal of Economics* 122(2), 647–91.
- Berrone, P., Cruz, C., and Gómez-Mejía, L. R. (2012). Socioemotional wealth in family firms: Theoretical dimensions, assessment approaches, and agenda for future research. *Family Business Review* 25(3), 258–279.

- Berrone, P., Cruz, C., Gómez-Mejía, L. R., and Larraza-Kintana, M. (2010). Socioemotional wealth and corporate responses to institutional pressures: Do family-controlled firms pollute less?. *Administrative Science Quarterly* 55(1), 82–113.
- Bingham, C. B., and Eisenhardt, K. M. (2011). Rational heuristics: The ‘simple rules’ strategists explicitly learn from their process experiences. *Strategic Management Journal* 32(13), 1437–1464.
- Bingham, C. B., Eisenhardt, K. M., and Furr, N. R. (2007). What makes a process a capability? Heuristics, strategy, and effective capture of opportunities. *Strategic Entrepreneurship Journal* 1(1–2), 27–47.
- Block, J. H. (2010). Family management, family ownership, and downsizing: Evidence from S&P 500 firms. *Family Business Review* 23(2), 109–130.
- Block, J. H. (2012). R&D investments in family and founder firms: An agency perspective. *Journal of Business Venturing* 27(2), 248–265.
- Block, J. H. , Miller, D., Jaskiewicz, P., and Spiegel, F. (2013). Economic and technological importance of innovations in large family and founder firms: An analysis of patent data. *Family Business Review* 26(2), 180–199.
- Bolton, M. K. (1993). Organizational innovation and substandard performance: When is necessity the mother of innovation?. *Organization Science* 4(1), 57–75.
- Bowman, E. H. (1980). A risk/return paradox for strategic management. *Sloan Management Review* 21(3), 17–31.
- Bowman, E. H. (1982). Risk seeking by troubled firms. *Sloan Management Review* 23(4), 33–42.
- Brannon, D. L., Wiklund, J., and Haynie, J. M. (2013). The varying effects of family relationships in entrepreneurial teams. *Entrepreneurship Theory and Practice* 37(1), 107–132.
- Bromiley, P. (1991). Testing a causal model of corporate risk taking and performance. *Academy of Management Journal* 34(1), 37–59.
- Brown, S. L., and Eisenhardt, K. M. (1995). Product development: Past research, present findings and future directions. *Academy of Management Review* 20(2), 343–378.
- Bruyat, C., and Julien, P. A. (2000). Defining the field of research in entrepreneurship. *Journal of Business Venturing* 16(2), 165–180.
- Burkart, M., Panunzi, F., and Shleifer, A. (2003). Family firms. *Journal of Finance* 58(5), 2167–2202.
- Busenitz L. W. (1999). Entrepreneurial risk and strategic decision making. *Journal of Applied Behavioral Science* 35(3), 325–340.

- Buyl, T., Boone, C. Hendriks, W., and Matthyssens P. (2011). Top management team functional diversity and firm performance: The moderating role of CEO characteristics. *Journal of Management Studies* 48(1), 151–177.
- Cameron, A. C., and Trivedi, P. K. (2010). *Microeconometrics Using Stata, Second Edition*. College Station: Stata Press.
- Carney, M. (2005). Corporate governance and competitive advantage in family-controlled firms. *Entrepreneurship Theory and Practice* 29(3), 249–265.
- Carroll, G. R., and Hannan, M. T. (2000). *The Demography of Corporations and Industries*. Princeton, NJ: Princeton University Press.
- Cefis, E., and Marsili, O. (2006). Survivor: The role of innovation in firms' survival. *Research Policy* 35(5), 626–641.
- Chambers, D., Jennings, R., and Thompson II. R. B. (2002). Excess returns to R&D-Intensive Firms. *Review of Accounting Studies* 7(2/3), 133–158.
- Chan, L., Lakonishok, J., and Sougiannis, T. (2001). The stock market valuation of research and development expenditures. *Journal of Finance* 56(2), 431–457.
- Chen, H. L., and Hsu, W. T. (2009). Family ownership, board independence and R&D investment. *Family Business Review* 22(4), 347–362.
- Chen W. R. (2008). Determinants of firms' backward- and forward-looking R&D search behavior. *Organization Science* 19(4), 609–622.
- Chen W. R., and Miller, K. D. (2007). Situational and institutional determinants of firms' R&D search intensity. *Strategic Management Journal* 28(4), 369–381.
- Chesbrough, H. (2003). The era of open innovation. *MIT Sloan Management Review* 44(3), 35-41.
- Chin, C. L., Chen, Y. J., Kleinman, G., and Lee, P. (2009). Corporate ownership structure and innovation: Evidence from Taiwan's electronics industry. *Journal of Accounting Auditing Finance* 24(1), 145–175.
- Chirico, F. and Salvato, C. (2008), Knowledge integration and dynamic organizational adaptation in family firms. *Family Business Review* 21(2), 169–181.
- Chrisman, J. J., Chua J. H., and Litz, R. (2004). Comparing the agency costs of family and non-family firms: Conceptual issues and exploratory evidence. *Entrepreneurship Theory and Practice* 28(4), 335–354.
- Chrisman, J. J., Chua, J. H., Pearson, A. W., and Barnett, T. (2012). Family involvement, family influence, and family-centered non-economic goals in small firms. *Entrepreneurship Theory and Practice* 36(2), 267–293.
- Chrisman, J. J., Chua, J. H., and Sharma, P. (2005). Trends and directions in the development of a strategic management theory of the family firm. *Entrepreneurship Theory and Practice* 29(5), 555–576.

- Chrisman, J. J., and Patel, P. J. (2012). Variations in R&D investments of family and non-family firms: Behavioral agency and myopic loss aversion perspectives. *Academy of Management Journal* 55(4), 976–997.
- Chrisman, J. J., Memili, E., and Misra, K. (forthcoming). Nonfamily managers, family Firms, and the winner's Curse: The Influence of noneconomic goals and bounded rationality. *Entrepreneurship Theory and Practice*.
- Chu, W. (2009). The influence of family ownership on SME performance: Evidence from public firms in Taiwan. *Small Business Economics* 33(3), 353–373.
- Chua, J. H., Chrisman, J. J., and Bergiel, E. (2009). An agency theoretic analysis of the professionalized family firm. *Entrepreneurship Theory and Practice* 33(2), 355–372.
- Chua, J. H., Chrisman, J. J., Kellermanns, F. W., and Wu, Z. (2011). Agency problems of borrowed social and financial capital: Resolution in new ventures through family involvement. *Journal of Business Venturing* 26(4), 472–488.
- Chua J. H., Chrisman, J. J., Steier, L. P., and Rau, S. B. (2012). Sources of heterogeneity in family firms: An introduction. *Entrepreneurship Theory and Practice* 36(6), 1103–1113.
- Chua, J. H., Chrisman, J. J., and Sharma, P. (1999). Defining the family business by behavior. *Entrepreneurship Theory and Practice* 23(4), 19–39.
- Classen, N., Carree, M., Van Gils, A. and Peters, B. (forthcoming). Innovation in family and non-family SMEs: An exploratory analysis. *Small Business Economics*. DOI: 10.1007/s11187-013-9490-z.
- Classen, N., Van Gils, A., Bammens, Y., and Carree, M. (2012). Accessing resources from innovation partners: The search breadth of family SMEs. *Journal of Small Business Management* 50(2), 191–215.
- Cochran W. G. (1977). *Sampling Techniques, Third Edition*. New York: John Wiley & Sons.
- Cohen, W., and Levinthal, D. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* 35(1), 128–152.
- Coleman, S., and Robb, A. (2009). A comparison of new firm financing by gender: Evidence from the Kauffman firm survey data. *Small Business Economics* 33(4), 397–411.
- Covin, T. J. (1994a). Perceptions of family-owned firms: The impact of gender and educational level. *Journal of Small Business Management* 32(3), 29–39.
- Covin, T. J. (1994b). Profiling preferences for employment in family-owned firms. *Family Business Review* 7(3), 287–296.
- Craig, J. B. L., and Dibrell, C. (2006). The natural environment, innovation, and firm performance: A comparative study. *Family Business Review* 19(4), 275–288.

- Crépon, B., Duguet, E., and Mairesse, J. (1998). Research and development, innovation and productivity: An econometric analysis at the firm level. *Economics of Innovation and New Technology* 7(2), 115–158.
- Cruz, C., and Nordqvist, M. (2012). Entrepreneurial orientation in family firms: A generational perspective. *Small Business Economics* 38(1), 33–49.
- Cruz, C., Justo, R., and De Castro, J. (2012). Does family employment enhance MSEs performance? Integrating socioemotional wealth and family embeddedness perspectives. *Journal of Business Venturing* 27(1), 62–76.
- Cyert, R. M., and March, J. G. (1963). *A Behavioral Theory of the Firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Czarnitzki, D., and Kraft, K. (2009). Capital control, debt financing and innovative activity. *Journal of Economic Behavior & Organization* 71(2), 372–383.
- Dahlander, L., and Gann, D. (2010). How open is innovation?. *Research Policy* 39(6), 699–709.
- Dahlin, K. B., Weingart, L. R., and Hinds, P. J. (2005). Team diversity and information use. *Academy of Management Journal* 48(6), 1107–1123.
- Daily, C. M., and Dollinger, M. J. (1993). Alternative methodologies for identifying family-versus non-family managed businesses. *Journal of Small Business Management* 31(2), 79–90.
- Das, T. K., and Teng, B. S. (2000). A resource-based theory of strategic alliances. *Journal of Management* 26(1), 31–61.
- De Massis, A., Frattini, F., and Lichtenthaler, U. (2013a). Research on technological innovation in family firms: Present debates and future directions. *Family Business Review* 26(1), 10–31.
- De Massis, A., Frattini, F., Pizzurno, E., and Cassia, L. (2013b). Product innovation in family vs. non-family firms: An exploratory analysis. *Journal of Small Business Management* 51(1).
- De Massis A., Kotlar J., Chua J. H., and Chrisman J. J. (forthcoming). Ability and willingness as sufficiency conditions for family-oriented particularistic behavior: Implications for theory and empirical studies. *Journal of Small Business Management*.
- De Massis, A., Sharma, P. A., Chua, J. H., and Chrisman, J. J. (2012). *Family Business Studies: An Annotated Bibliography*. Northhampton, MA: Edward Elgar.
- Deephouse, D. L. and Jaskiewicz, P. (2013). Do family firms have better reputations than non-family firms? An integration of socioemotional wealth and social identity theories. *Journal of Management Studies* 50(3), 337–360.
- Dew, N., Read, S., Sarasvathy, S., and Wiltbank, R. (2008). Outlines of a behavioral theory of the entrepreneurial firm. *Journal of Economic Behavior and Organization* 66(1), 37–59.

- Dew, N., Sarasvathy, S., Read, S., and Wiltbank, R. (2009). Affordable loss: Behavioral economic aspects of the plunge decision. *Strategic Entrepreneurship Journal* 3(2), 105–126.
- Distelberg, B., and Sorenson, R. L. (2009). Updating systems concepts in family businesses. *Family Business Review* 22(1), 65–81.
- Dittrich, K., and Duysters, G. (2007). Networking as a means to strategy change: The case of open innovation in mobile telephony. *Journal of Product Innovation Management* 24(6), 510–521.
- Dollinger, M. J. (1984). Environmental boundary spanning and information processing effects on organizational performance. *Academy of Management Journal* 27(2), 351–368.
- Donnelley, R. (1964). The family business. *Harvard Business Review* 42(2), 93–105.
- Dyer, J. H., Gregersen, H. B., and Christensen C. (2008). Entrepreneur behaviors, opportunity recognition, and the origins of innovative ventures. *Strategic Entrepreneurship Journal* 2(4), 317–338.
- Dyer, W. G. (1988). Culture and continuity in family firms. *Family Business Review* 1(1), 7–50.
- Dyer, W. G. (1989). Integrating professional management into a family owned business. *Family Business Review* 2(3), 221–235.
- Dyer, W. G., and Whetten, D. A. (2006). Family firms and social responsibility: Preliminary evidence from the S&P 500. *Entrepreneurship Theory and Practice* 30(6), 785–802.
- Eddleston, K. A., and Kellermanns, F. W. (2006). Destructive and productive family relationships: A stewardship theory perspective. *Journal of Business Venturing* 22(4), 545–565.
- Eddleston, K. A., Kellermanns, F. W., and Sarathy, R. (2008). Resource configuration in family firms: Linking resources, strategic planning and technological opportunities to performance. *Journal of Management Studies* 45(1), 26–50.
- Eisenhardt, K., and Schoonhoven, C. B. (1996). Resource-based view of strategic alliance formation: Strategic and social effects in entrepreneurial companies. *Organization Science* 7(2), 136–150.
- Ensley, M. D., and Pearson, A. W. (2005). An exploratory comparison of the behavioral dynamics of top management teams in family and non-family new ventures: Cohesion, conflict, potency, and consensus. *Entrepreneurship Theory and Practice* 29(3), 267–284.
- Esteve-Pérez, S., and Mañez-Castillejo, J. A. (2008). The resource-based theory of the firm and firm survival. *Small Business Economics* 30(3), 231–249.
- European Commission (2012). *SBA Fact Sheet 2012: Germany*. Retrieved 02.12.2012 from the World Wide Web: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2012/germany_en.pdf.

- Eurostat (2010). *Aggregations of Manufacturing Based on NACE Rev 1.1*, http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/htec_esms_an2.pdf (accessed September 16, 2010).
- Faems, D., de Visser, M., Andries, P., and Van Looy, B. (2010). Technology alliance portfolios and financial performance: Value-enhancing and cost-increasing effects of open innovation. *Journal of Product Innovation Management* 27(6), 785–796.
- Family Firm Institute (2013). *Global Data Points*. Retrieved 10.05.2013 from the World Wide Web: <http://www.ffi.org/?page=GlobalDataPoints>
- Fann, G. L., and Schmeltzer, L. R. (1989). The use of information from and about competitors in small business management. *Entrepreneurship Theory and Practice* 13(4), 35–46.
- Fernández, Z., and Nieto, M. J. (2006). Impact of ownership on the international involvement of SMEs. *Journal of International Business Studies* 37(3), 340–351.
- Fiegenbaum, A., Hart, S., and Schendel, D. (1996). Strategic reference point theory. *Strategic Management Journal* 17(3), 219–235.
- Fiegenger, M. K., Brown, B. M. Prince, R. A., and File, K. M. (1996). Passing on strategic vision. *Journal of Small Business Management* 34(3), 15–26.
- Freeman, J., Carroll, G. R., and Hannan, M. T. (1983). The liability of newness: Age dependence in organizational death rates. *American Sociological Review* 48(5), 692–710.
- Gaba, V., and Bhattacharya, S. (2012). Aspirations, innovation, and corporate venture capital: A behavioral perspective. *Strategic Entrepreneurship Journal* 6(2), 178–199.
- Gedajlovic, E., Carney, M., Chrisman, J., and Kellermanns, F. (2012). The adolescence of family firm research: Taking stock and planning for the future. *Journal of Management* 38(4), 1010–1037.
- Gentry, R., and Shen, W. (2013). The impacts of performance relative to analyst forecasts and analyst coverage on firm R&D intensity. *Strategic Management Journal* 34(1), 121–130.
- Gersick, K. E., Davis, J. A., Hampton, M. M., and Lansberg, I. (1997). *Generation to Generation: Life Cycles of the Family Business*. Boston: Harvard Business School Press.
- Gómez-Mejía, L. R., Haynes, K. T., Núñez-Nickel, M., Jacobson, K. J. L., and Moyano-Fuentes, H. (2007). Socioemotional wealth and business risk in family-controlled firms: Evidence from Spanish olive oil mills. *Administrative Science Quarterly* 52(1), 106–137.
- Gómez-Mejía, L. R., Makri, M., and Larraza-Kintana, M. (2010). Diversification decisions in family-controlled firms. *Journal of Management Studies* 47(2), 223–252.

- Gómez-Mejía, L. R., Cruz, C., Berrone, P., and De Castro, J. (2011). The bind that ties: Socioemotional wealth preservation in family firms. *The Academy of Management Annals* 5(1), 653–707.
- Gong, Y., Shenkar, O., Luo, Y., and Nyaw, M. (2007). Do multiple parents help or hinder international joint venture performance? The mediating roles of contract completeness and partner cooperation. *Strategic Management Journal* 28(10), 1021–1034.
- Greve, H. R. (1998). Performance, aspirations, and risky organizational change. *Administrative Science Quarterly* 43(1), 58–86.
- Greve, H. R. (2003). A behavioral theory of R&D expenditures and innovations: Evidence from shipbuilding. *Academy of Management Journal* 46(6), 685–702.
- Griffith, R., Huergo, E., Mairesse, J., and Peters B. (2006). Innovation and productivity across four European countries. *Oxford Review of Economic Policy* 22(4), 483–498.
- Grimpe, C., and Sofka, W. (2009). Search patterns and absorptive capacity: Low- and high-technology sectors in European countries. *Research Policy* 38(3), 495–506.
- Gudmundson, D., Tower, C. B., and Hartman, E. A. (2003). Innovation in small businesses: Culture and ownership structure do matter. *Journal of Developmental Entrepreneurship* 8(1), 1–18.
- Habbershon, T. G., and Pistrui, J. (2002). Enterprising families domain: Family-influenced ownership groups in pursuit of transgenerational wealth. *Family Business Review* 15(3), 223–238.
- Habbershon, T., Williams, M., and MacMillan, I. (2003). A unified systems perspective of family firm performance. *Journal of Business Venturing* 18(4), 451–465.
- Hagedoorn, J. (1993). Understanding the rationale of strategic technology partnering: Interorganizational modes of cooperation and sectoral differences. *Strategic Management Journal* 14(3), 371–385.
- Hall, B. H., Lotti, F., and Mairesse, J. (2009). Innovation and productivity in SMEs: Empirical evidence for Italy. *Small Business Economics* 33(1), 13–33.
- Hambrick, D. C. (1994). Top management groups: A conceptual integration and reconsideration of the ‘team’ label. *Research in Organizational Behavior* 16(4), 171–214.
- Hambrick, D. C., and Mason, P. A. (1984). Upper Echelons: The organization as a reflection of its top managers. *Academy of Management Review* 9(2), 193–206.
- Hannan, M. T., and Freeman, J. (1984). Structural inertia and organizational change. *American Sociological Review* 49(2), 149–164.
- Hayward, M. L. A., Shepherd, D. A., and Griffin, D. (2006). A hubris theory of entrepreneurship. *Management Science* 52(2), 160–172.

- Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica* 47(1), 153–161.
- Helfat, C. E. (1994). Evolutionary trajectories in petroleum firm research and development. *Management Science* 40(12) 1720–1747.
- Hill, C. W. L., and Snell, S. A. (1988). External control, corporate strategy, and firm performance in research-intensive industries. *Strategic Management Journal* 9(6), 577–590.
- Hinsz, V. B., Tindale, R. S., and Vollrath, D. A. (1997). The emerging conceptualization of groups as information processes. *Psychological Bulletin* 121(1), 43–64.
- Hitt, M. A., and Tyler, B. B. (1991). Strategic decision models: Integrating different perspectives. *Strategic Management Journal* 12(4), 327–351.
- Holderness, C. G., and Sheehan, D. P. (1988). The role of majority shareholders in publicly held corporations: An exploratory analysis. *Journal of Financial Economics* 20(1–2), 317–346.
- Horton, T. P. (1986). Managing in a family way. *Management Review* 75(2), 3.
- IFERA. (2003). Family businesses dominate. *Family Business Review* 16(4), 235–240.
- Janis, I. (1982). *Groupthink, 2nd ed.* Boston: Houghton Mifflin.
- Jennings, R., and Lumpkin, G. T. (1989). Functioning modeling corporate entrepreneurship: An empirical integrative analysis. *Journal of Management* 15(3), 485–502.
- Johnson, J., and Kuehn, R. (1987). The small business owner/manager's search for external information. *Journal of Small Business Management* 25(3), 53–60.
- Kahneman, D., and Tversky, A. (1979). Prospect theory - analysis of decision under risk. *Econometrica* 47(2), 263–291.
- Kanuk, L., and Berenson, C. (1975). Mail surveys and response rates: A literature review. *Journal of Marketing Research* 12(4), 440–453.
- Katila, R., and Ahuja, G. (2002). Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal* 45(8), 1183–1194.
- Kellermanns, F., Eddleston, K., Sarathy, R., and Murphy, F. (2012). Innovativeness in family firms: A family influence perspective. *Small Business Economics* 38(1), 85–101.
- Kihlstrom, R., and Laffont, J. J. (1979). A general equilibrium entrepreneurship theory of the firm based on risk aversion. *Journal of Political Economy* 87(4), 719–748.
- Kimberly, J. R., and Evanisko, M. J. (1981). Organizational innovation: The influence of individual, organizational and contextual factors on hospital adoption of technical and administrative innovations. *Academy of Management Journal* 24(4), 689–713.
- Kish L. (1987). *Statistical Design for Research.* New York: John Wiley & Sons.

- Klein, S. B. (2000). Family businesses in Germany: Significance and structure. *Family Business Review* 13(3), 157–181.
- Kloyer, M., and Scholderer, J. (2012). Effective incomplete contracts and milestones in market-distant R&D collaboration. *Research Policy* 41(2), 346–357.
- Knight, D., Pearce, C. L., Smith, K. G., Olian, J. D., Sims, H. P., Smith, K. A., and Flood, P. (1999). Top management team diversity, group process, and strategic consensus. *Strategic Management Journal* 20(5), 445–465.
- König, A., Kammerlander, N., and Enders, A. (2013). The family innovator's dilemma: How family influence affects the adoption of discontinuous technologies by incumbent firms. *Academy of Management Review* 38(3), 418–441.
- Kotlar, J., De Massis, A., Frattani, F., Fang, H., and Bianchi, M. (forthcoming). Technology Acquisition in Family and Non-Family Firms: A Longitudinal Analysis of Spanish Manufacturing Firms. *Journal of Product Innovation Management*. ISSN: 0737-6782.
- Kumar, N., Stern, L. W., and Anderson, J. C. (1993). Conducting interorganizational research using key informants. *Academy of Management Journal* 36(6), 1633–1651.
- Lampert, C. M., and Semadeni, M. (2010). Search breadth and the costs of search. In *Proceedings of the Seventieth Annual Meeting of the Academy of Management* (CD). Ed. L. A. Toombs.
- Lane P. J., and Lubatkin, M. (1998). Relative absorptive capacity and interorganizational learning. *Strategic Management Journal* 19(5), 461-477.
- Latham, S. F., and Braun, M. (2009). Managerial risk, innovation and organizational decline. *Journal of Management* 35(2), 258–281.
- Laursen, K., and Salter, A. (2004). Searching high and low: What types of firms use universities as a source of innovation?. *Research Policy* 33(8), 1201–1215.
- Laursen, K., and Salter, A. (2006). Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal* 27(2), 131–150.
- Leiponen, A., and Helfat, C. (2010). Innovation objectives, knowledge sources, and the benefits of breadth. *Strategic Management Journal* 31(2), 224–236.
- Levinthal, D. A., and March, J. G. (1993). The myopia of learning. *Strategic Management Journal, Special Issue: Organizations, Decision Making and Strategy* 14, 95–112.
- Lichtenthaler, U. (2011). Open innovation: Past research, current debates, and future directions. *Academy of Management Perspectives* 25(1), 75–93.
- Lim, E. N. K., Lubatkin, M. H., and Wiseman, R. M. (2010). A family firm variant of the behavioral agency theory. *Strategic Entrepreneurship Journal* 4(3), 197–211.

- Ling, Y., Simsek, Z., Lubatkin, M., and Veiga, J. F. (2008). Transformational leadership's role in promoting corporate entrepreneurship: Examining the CEO-TMT interface. *Academy of Management Journal* 51(3), 557–576.
- Lohr, S. L. (2010). *Sampling: Design and Analysis, Second Edition*. Pacific Grove, CA: Duxbury Press.
- Lööf, H., and Heshmati, A. (2002). Knowledge capital and performance heterogeneity: A firm level innovation study. *International Journal of Production Economics* 76(1), 61–85.
- Lööf, H., and Heshmati, A. (2006). On the relationship between innovation and performance: A sensitivity analysis. *Economics of Innovation and New Technology* 15(4–5), 317–345.
- Lubatkin, M. H., Schulze, W. S., Ling, Y., and Dino, R. D. (2005). The effects of parental altruism on the governance of family-managed firms. *Journal of Organizational Behavior* 26(3), 313–330.
- Lumpkin G. T., Steier, L., and Wright, M. (2011). Strategic entrepreneurship in family business. *Strategic Entrepreneurship Journal* 5(4), 285–306.
- Mairesse, J., and Mohnen, P. (2010). *Using Innovation Surveys for Econometric Analysis*. In: Hall, B. H., and Rosenberg, N. (Eds.), *Handbook of the Economics of Innovation*, Elsevier, Amsterdam, 1130–1155.
- Malhotra, D., and Lumineau, F. (2011). Trust and collaboration in the aftermath of conflict: The effects of contract structure. *Academy of Management Journal* 54(5), 981–998.
- March J. G., and Shapira, Z. (1992). Variable risk preferences and the focus of attention. *Psychological Review* 99(1), 172–183.
- March, J. G., and Simon, H. A. (1958). *Organizations*. New York: John Wiley and Sons.
- Martikainen, M., Nikkinen, J., and Vähämaa, S. (2009). Production functions and productivity of family firms: Evidence from the S&P 500. *The Quarterly Review of Economics and Finance* 49(2), 295–307.
- Maury, B. (2006). Family ownership and firm performance: Empirical evidence from Western European corporations. *Journal of Corporate Finance* 12(2), 321–341.
- McCauley, C. (1998). Group dynamics in Janis's theory of groupthink: Backward and forward. *Organizational Behavior and Human Decision Processes* 73(2–3), 142–162.
- McConaughy, D. L., and Phillips, G. M. (1999). Founders versus descendants: The profitability, efficiency, growth characteristics and financing in large, public, founding-family-controlled firms. *Family Business Review* 12(2), 123–131.
- McConaughy, D. L., Walker, M. C., Henderson, G. V., and Mishra, C. S. (1998). Founding family controlled firms: Efficiency and value. *Review of Financial Economics* 7(1), 1–19.
- Miller, D., and Chen, W. R. (2004). Variable organizational risk preferences: Tests of the March Shapira Model. *Academy of Management Journal* 47(1), 105–115.

- Miller, D., Le Breton-Miller, I., and Lester, R. H. (2011). Family and lone-founder ownership and strategic behavior: Social context, identity and institutional logics. *Journal of Management Studies* 48(1), 1–25.
- Miller, D., Le Breton-Miller, I., and Lester, R. H. (2013). Family firm governance, strategic conformity, and performance: Institutional vs. strategic perspectives. *Organization Science* 24(1), 189–209.
- Miller, D., Le Breton-Miller, I., Lester, R. H., and Cannella, A. A. (2007). Are family firms really superior performers?. *Journal of Corporate Finance* 13(5), 829–858.
- Miller, D., Le Breton-Miller, I., and Scholnick, B. (2008). Stewardship vs. stagnation: An empirical comparison of small family and non-family businesses. *Journal of Management Studies* 45(1), 51–78.
- Miller, D., Minichilli, A., and Corbetta, G. (2013). Is family leadership always beneficial?. *Strategic Management Journal* 34(5), 553–571.
- Milliken, F. J., and Martins, L. L. (1996). Searching for common threads: Understanding the multiple effects of diversity in organizational groups. *Academy of Management Review* 21(2), 402–433.
- Miotti, L., and Sachwald, F. (2003). Co-operative R&D: Why and with whom? An integrated framework of analysis. *Research Policy* 32(8), 1481–1499.
- Monjon, S., and Waelbroeck, P. (2003). Assessing spillovers from universities to Firms: Evidence from French firm-level data. *International Journal of Industrial Organization* 21(9), 1255–1270.
- Monopolkommission. (2008). *Weniger Staat, mehr Wettbewerb - Gesundheitsmärkte und staatliche Beihilfen*. Hauptgutachten XVII (2006/2007), Nomos: Baden-Baden.
- Morck, R., and Yeung, B. (2003). Agency problems in large family business groups. *Entrepreneurship Theory and Practice* 27(4), 367–382.
- Munari, F., Oriani, R., and Sobrero, M. (2010). The effects of owner identity and external governance systems on R&D investments: A study of Western European firms. *Research Policy* 39(8), 1093–1104.
- Muñoz-Bullón, F., and Sanchez-Bueno, M. J. (2011). The impact of family involvement on the R&D intensity of publicly traded firms. *Family Business Review* 24(1), 62–70.
- Naldi, L., Nordqvist, M., Sjöberg, K., and Wiklund, J. (2007). Entrepreneurial orientation, risk taking, and performance in family firms. *Family Business Review* 20(1), 33–47.
- Nelson, R. R., and Winter, S. G. (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.
- Nordqvist, M. (2005). Familiness in top management teams: Commentary on Ensley and Pearson's 'An exploratory comparison of the behavioral dynamics of top management teams in family and nonfamily new ventures: Cohesion, conflict, potency, and consensus'. *Entrepreneurship Theory and Practice* 29(3), 285–292.

- OECD, and Eurostat. (2005). *Oslo manual: Guidelines for collecting and interpreting innovation data* (3rd ed.). Organisation for Economic Co-operation and Development, Statistical Office of the European Communities, Paris.
- Olson, B. J., Parayitam, S., and Bao, Y. J. (2007). Strategic decision making: The effects of cognitive diversity, conflict, and trust on decision outcomes. *Journal of Management* 33(2), 196–222.
- Oswald, S. L., Muse, L. A., and Rutherford, M. W. (2009). The influence of large stake family control on performance: Is it agency or enrichment?. *Journal of Small Business Management* 47(1), 116–135.
- Panico, C. (2011). On the contractual governance of research collaborations: Allocating control and intellectual property rights in the shadow of potential termination. *Research Policy* 40(10), 1403–1411.
- Panico, C. (2012). Control and contract design in research collaborations: A complete contract perspective. *International Journal of Industrial Organization* 30(5), 459–470.
- Papadakis, V. M., and Barwise, P. (2002). How much do CEOs and top managers matter in strategic decision-making?. *British Journal of Management* 13(1), 83–95.
- Patel, P. C., and Chrisman, J. J. (forthcoming). Risk abatement as a strategy for R&D investments in family firms. *Strategic Management Journal*, doi.org/10.1002/smj.2119.
- Peters, B. (2008). *Innovation and firm performance: An empirical investigation for German firms*. ZEW Economic Studies, 38, Physica Heidelberg, New York.
- Phelps, C. C. (2010). A longitudinal study of the influence of alliance network structure and composition on firm exploratory innovation. *Academy of Management Journal* 53(4), 890–913.
- Pindyck, R. S. (1991). Irreversibility, uncertainty, and investment. *Journal of Economic Literature* 26(3), 1110–1148.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology* 88(5), 879–903.
- Poppo, L., and Zenger, T. (2002). Do formal contracts and relational governance function as substitutes or complements?. *Strategic Management Journal* 23(8), 707–725.
- Poza, J. E. (2010). *Family Business, 3rd Edition*. Ohio: South-Western Cengage Learning.
- Ritala, P., and Hurmelinna-Laukkanen, P. (2013). Incremental and radical innovation in co-competition – The role of absorptive capacity and appropriability. *Journal of Product Innovation Management* 30(1), 154–169.
- Robb A. M., and Watson, J. (2012). Gender differences in firm performance: Evidence from new ventures in the United States. *Journal of Business Venturing* 27(5), 544–558.

- Roper, S. (1997). Product innovation and small Business growth: A comparison of the strategies of German, U.K. and Irish companies. *Small Business Economics* 9(6), 523–537.
- Rosenbusch, N., Brinckmann, J., and Bausch, A. (2011). Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs. *Journal of Business Venturing* 26(4), 441–457.
- Salvato, C. (2004). Predictors of entrepreneurship in family firms. *Journal of Private Equity* 7(3), 68–76.
- Salvato, C., and Melin, L. (2008). Creating value across generations in family-controlled businesses: The role of family social capital. *Family Business Review* 21(3), 259–276.
- Schjoedt, L., Monsen, E., Pearson, A., Barnett, T., and Chrisman, J. J. (2013). New venture and family business teams: Understanding team formation, composition, behaviors, and performance. *Entrepreneurship Theory and Practice* 37(1), 1–15.
- Schulman PR. 1993. The negotiated order of organizational reliability. *Administration & Society* 25(3): 353-372.
- Schulze, W. S., Lubatkin, M. H., and Dino, R. N. (2003). Exploring the agency consequences of ownership dispersion among the directors of private family firms. *Academy of Management Journal* 46(2), 179–194.
- Schulze, W. S., and Gedajlovic, E. R. (2010). Whither Family Business?. *Journal of Management Studies* 47(2), 191–204.
- Schulze, W. S., Lubatkin, M., Dino R., and Buchholtz., A. (2001). Agency relationships in family firms: Theory and evidence. *Organization Science* 12(2), 99–116.
- Schumpeter, J. A. (1942). *Capitalism, Socialism and Democracy*. New York: Harper.
- Schweiger, D. M., Sandberg, W. R., and Ragan, J. W. (1986). Group approaches for improving strategic decision making: A comparative analysis of dialectical inquiry, devil’s advocacy, and consensus. *Academy of Management Journal* 29(1), 51–71.
- Shane, S. A. (2008). *The Illusions of Entrepreneurship: The Costly Myths That Entrepreneurs, Investors and Policy Makers Live By*. New Haven, CT: Yale University Press.
- Shapira, Z. (1995). *Risk Taking: A Managerial Perspective*. New York: Russell Sage Foundation.
- Shi, C. (2003). On the trade-off between the future benefits and riskiness of R&D: A bondholders’ perspective. *Journal of Accounting and Economics* 35(2), 227–254.
- Shipton, H., West, M., Dawson, J., Birdi, K., and Patterson, M. (2006). HRM as a predictor of innovation. *Human Resource Management Journal* 16(1), 3–27.

- Sieger, P., Zellweger, T., Nason, R. S., and Clinton, E. (2011). Portfolio entrepreneurship in family firms: A resource-based perspective. *Strategic Entrepreneurship Journal* 5(4), 327–351.
- Simon, H. (2009). *Hidden Champions of the 21st Century: Success Strategies of Unknown World Market Leaders*. London: Springer.
- Simons, T., Pelled, L. H., and Smith, K. A. (1999). Making use of difference: Diversity, debate, and decision comprehensiveness in top management teams. *Academy of Management Journal* 42(6), 662–673.
- Simsek, Z., Veiga, J. F., Lubatkin, M. H., and Dino, R. N. (2005). Modeling the multilevel determinants of top management team behavioral integration. *Academy of Management Journal* 48(1), 69–84.
- Singh, J. V. (1986). Performance, slack, and risk taking in organizational decision making. *Academy of Management Journal* 29(3), 562–585.
- Sirmon, D. G., and Hitt, M. A. (2003). Managing resources: Linking unique resources, management and wealth creation in family firms. *Entrepreneurship Theory and Practice* 27(4), 339–358.
- Smith, K. G., Smith, K. A., Olian, J. D., Sims, H. P., O'Bannon, D. P., and Scully, J. A. (1994). Top management team demography and process: The role of social integration and communication. *Administrative Sciences Quarterly* 39(3), 412–438.
- Snow, C., Fjeldstad, Ø., Lettl, C., and Miles, R. (2011). Organizing continuous product development and commercialization: The collaborative community of firms model. *Journal of Product Innovation Management* 28(1), 3–16.
- Sonfield, M. C., and Lussier, R. N. (2009). Non-family-members in the family business management team: A multinational investigation. *International Entrepreneurship and Management Journal* 5(4), 395–415.
- Sraer, D., and Thesmar, D. (2007). Performance and behavior of family firms: Evidence from the French stock market. *Journal of the European Economic Association* 5(4), 709–51.
- Stanley, L. J. (2010). Emotions and family business creation: An extension and implications. *Entrepreneurship Theory and Practice* 34(6), 1085–1092.
- Staw, B., Sandelands, L., and Dutton, J. (1981). Threat-rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly* 26(4), 501–524.
- Steier, L. (2001). Family firms, plural forms of governance, and the evolving role of trust. *Family Business Review* 14(4), 353–368.
- Steier, L. (2003). Variants of agency contracts in family-financed ventures as a continuum of familial altruistic and market rationalities. *Journal of Business Venturing* 18(5), 597–618.
- Stiftung Familienunternehmen. (2011). *Die Volkswirtschaftliche Bedeutung von Familienunternehmen*. Munich. Retrieved 07.01.2013 from the World Wide Web:

http://www.familienunternehmen.de/media/public/pdf/studien/Die_volkswirtschaftliche_Bedeutung_der_Familienunternehmen.pdf

- Stinchcombe, A. (1965). *Social Structure and Organizations*. In Handbook of Organizations, March, J. G. (ed). Rand McNally: Chicago, IL; 153–193.
- Street, C. T., and Cameron, A. (2007). External relationships and the small business: A review of small business alliance and network research. *Journal of Small Business Management* 45(2), 239–266.
- Sundaramurthy, C. (2008). Sustaining trust within family businesses. *Family Business Review* 21(1), 89–102.
- Sungjoo, L., Gwangman, P., Byungun, Y., and Park, J. (2010). Open innovation in SMEs—An intermediated network model. *Research Policy* 39(2), 290–300.
- Tagiuri, R., and Davis, J. A. (1996). Bivalent attributes of the family firm. *Family Business Review* 9(2), 199–208.
- Tan, J., Fischer, E., Mitchell, R. and Phan, P. (2009). At the center of the action: Innovation and technology strategy research in the small business setting. *Journal of Small Business Management* 47(3), 233–262.
- Teece, D. J. (1980). Economics of scope and the scope of the enterprise. *Journal of Economic Behavior and Organization* 1(3), 223–247.
- Terziowski, M. (2010). Innovation practice and its performance implications in small and medium enterprises (SMES) in the manufacturing sector: A resource-based view. *Strategic Management Journal* 31(8), 892–902.
- Tether, B. S. (1998). Small and large firms: Sources of unequal innovations? *Research Policy* 27(7), 725–745.
- Tether, B. (2002). Who co-operates for innovation, and why: An empirical analysis, *Research Policy* 31(6), 947–967.
- Thomas, A. S., Litschert, R. J., and Ramaswamy, K. (1991). The performance impact of strategy-manager coalignment: An empirical examination. *Strategic Management Journal* 12(7), 509–522.
- Trott, P. (2008). *Innovation Management and New Product Development, 4th edition*. Harlow, UK: Prentice Hall.
- Tsai W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal* 44(5), 996–1004.
- Van de Vrande, V., De Jong, J., Vanhaverbeke, W., and De Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation* 29(6–7), 423–437.

- Van Den Bosch, F. A. J., Van Wijk, R., and Volberda, H. W. (2003). *Absorptive Capacity: Antecedents, Models, and Outcomes*. In Handbook of Organizational Learning and Knowledge Management. Eds. M. Easterby-Smith and M. A. Lyles. Oxford: Blackwell, 278–301.
- Van Knippenberg, D., and Schippers, M. C. (2007). Work group diversity. *Annual Review of Psychology* 58(1), 515–541.
- Vanhaverbeke, W., Gilsing, V., and Duysters, G. (2012). Competence and governance in strategic collaboration: The differential effect of network structure on the creation of core and noncore technology. *Journal of Product Innovation Management* 29(5), 784–802.
- Verhees, F. J., and Meulenbergh, M. T. (2004). Market orientation, innovativeness, product innovation, and performance in small firms. *Journal of Small Business Management*, 42(2), 134–154
- Villalonga, B., and Amit, R. (2006). How do family ownership, control, and management affect firm value?. *Journal of Financial Economics* 80(2), 385–417.
- Vissa, B., Greve H. R., and Chen, W. (2010). Business group affiliation and firm search behavior in India: Responsiveness and focus of attention. *Organization Science* 21(3), 696–712.
- Von Hippel, E. (1988). *Sources of Innovation*. Oxford: Oxford University Press.
- Wally, S., and Baum, J. (1994). Personal and structural determinants of the pace of strategic decision making. *Academy of Management Journal* 37(4), 932–956.
- Westhead, P. (1997). Ambitions, external environment and strategic factor differences between family and non-family companies. *Entrepreneurship & Regional Development* 9(2), 127–158.
- Westhead, P., and Cowling, M. (1998). Family firm research: The need for a methodological rethink. *Entrepreneurship Theory and Practice* 23(1), 31–56.
- Westhead, P., and Howorth, C. (2007). Types of private family firms: An exploratory conceptual and empirical analysis. *Entrepreneurship and Regional Development* 19(5), 405–431.
- Wiersema, M. F., and Bantel, K. A. (1992). Top management team demography and corporate strategic change. *Academy of Management Journal* 35(1), 91–121.
- Wiseman R. M., and Bromiley, P. (1996). Toward a model of risk in declining organizations: An empirical examination of risk, performance and decline. *Organization Science* 7(5), 524–543.
- Wiseman R. M., and Gómez-Mejía, L. R. (1998). A behavioral agency model of managerial risk taking. *Academy of Management Review* 23(1), 133–153.
- Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.

- World Economic Forum (2010). *The Global Competitiveness Report 2010–2011*. Retrieved 21.04.2013 from the World Wide Web:
http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2010-11.pdf
- Wuyts, S., and Geyskens, I. (2005). The formation of buyer-supplier relationships: Detailed contract drafting and close partner selection. *Journal of Marketing* 69(4), 103–117.
- Zahra, S. A. (2005). Entrepreneurial risk taking in family firms. *Family Business Review* 18(1), 23–40.
- Zahra, S. A. (2012). Organizational learning and entrepreneurship in family firms: Exploring the moderating effect of ownership and cohesion. *Small Business Economics* 38(1), 51–65.
- Zahra, S. A., and George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review* 27(2), 185–203.
- Zahra, S. A., Hayton, J. C., Neubaum, D. O., Dibrell, C., and Craig, J. (2008). Culture of family commitment and strategic flexibility: The moderating effect of stewardship. *Entrepreneurship Theory and Practice* 32(6), 1035–1054.
- Zahra, S. A., Neubaum, D. O., and Huse, M. (2000). Entrepreneurship in medium size companies: Exploring the effects of ownership and governance systems. *Journal of Management* 26(5), 947–976.
- Zellweger, T. M. (2007). Time horizon, costs of equity capital, and generic investment strategies of firms. *Family Business Review* 20(1), 1–15.
- Zellweger, T. M., Kellermanns, F. W., Chrisman, J. J., and Chua, J. H. (2012). Family control and family firm valuation by family CEOs: The importance of intentions for transgenerational control. *Organization Science* 23(3), 851–68.
- Zellweger, T. M., Nason, R. S., Nordqvist, M., and Brush, C. G. (2011). Why do family firms strive for nonfinancial goals? An organizational identity perspective. *Entrepreneurship Theory and Practice* 37(2), 229–248.
- Zhang, M., Macpherson, A., and Jones, O. (2006). Conceptualizing the learning process in SMEs: Improving innovation through external orientation. *International Small Business Journal* 24(3), 299–323.

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BIOGRAPHY

Nicolas Classen was born on September 3, 1982 in Viersen, Germany. He attended the Louise-von-Duisberg-Gymnasium in Kempen, where he graduated in 2001. Subsequently, Nicolas absolved his civil service at a sheltered workshop of the Heilpädagogisches Zentrum in Grefrath-Vinkrath in 2002. After having finished a two-year apprenticeship at Deutsche Bank AG in Düsseldorf in 2004, Nicolas studied International Business at the Faculty of Economics and Business Administration at Maastricht University in the Netherlands and he received his Master's Degree in Strategy and Innovation with cum laude in 2009. During his studies, he spent an academic semester at the University of Sydney (Australia) in fall 2007. He started his four-year PhD program at Maastricht University (Department of Organization and Strategy) in September 2009. Since 2011 Nicolas is also affiliated with the Center for European Economic Research (ZEW) in Mannheim, Germany. From January till May 2013 he visited Professor Daniel Wolfenzon at Columbia Business School in New York. In September 2013 Nicolas started his new position as Assistant Professor of Entrepreneurship and Strategy at Rotterdam School of Management, Department of Strategic Management and Entrepreneurship.