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Master Thesis

Risk-Taking Behavior of European Family Firms:
A Comparison of Family Firms versus Non-Family Firms
and their Level of Risk-Taking

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Differences in risk-taking behavior were examined between two type of firms, family firms and non-family firms. From a sample of 236 publicly listed European firms, we use data of the year 2018. The study shows that family firms take less risks in comparison to non-family firms, since the intangible quality "familiness" is of great importance. Different levels of family involvement have been investigated and overall, the main findings suggest that the family involvement is most powerful when majority of the shares are held by the family and the CEO is a family member. In addition, the study found support for several characteristics moderating the relationship between the family and risk-taking behavior, such as firm growth, firm performance, and the level of diversification. These characteristics typically distinguish family and non-family firms from each other.
Keywords: family firms, family involvement, risk-taking behavior, moderating effects, Altman Z-score, matched-pairs methodology design, Europe

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Preface

This thesis is a final work that has been written to fulfill the graduation for the degree of Master of Science in Economics, specialization Corporate Finance and Control at the Radboud University in Nijmegen. The thesis is titled "Risk-taking Behavior of European Family Firms", the basis of which is a research on risk-taking behavior within family firms.

I could not have achieved my current level of success without a strong support group. First of all, I want to thank my family and friends, who supported me with love and understanding. And secondly, I want to thank my supervisor Dr. Sascha Füllbrunn, who provided helpful feedback, good advice, and guidance throughout the whole process of writing my Master thesis. Thank you all for the unwavering support.

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C.A.M. (Carlijn) Huijbregts

Table of Contents

List of Figures and Tables

1. Introduction

   Family firms are often said to be the original form of business activity. These businesses are dominating the economic landscape of major economies in the world. It is frequently referred to as "the backbone of corporate life". Researchers studying the family firm believe that the involvement of family makes them distinct from a non-family firm (Kraus, Harms, & Fink, 2011). To better understand the differences, the interest in family business research is developing rapidly and has grown significantly over the last years. This guides to an emerging field of study in business and finance research (Burkart, Panunzi, & Shleifer, 2002). Most publicly traded firms are controlled by their founders, or by the families of the founders. Family firms account for two thirds of all businesses around the world and generate 70 to 90 percent of annual global GDP, in accordance with the latest statistics from the Family Firm Institute (Frattini, Majocchi, Massis, & Piscitello, 2018). In the United States, about one third of the S&P 500 firms are owned, controlled, or managed by the founding family. However, according to Botero et al. (2015), family businesses might even be more important in Europe since they are major contributors to different European economies (Botero, Cruz, Massis, & Nordqvist, 2015). As mentioned, many empirical researches conducted in this field of study indicate differences between family firms and non-family firms. Differences arise in many aspects, such as strategic and organizational orientation, competitiveness, managing of human resources, and financial decision-making. In general, according to financial management principles, the main goal of the financial function is to maximize the value of the firm's stock. In the study of Gallo et al. (2004) they argue that family firms, however, not only take this into consideration. Family firms also emphasize the importance of job opportunity offerings to family members, but also staying in power for long periods of time and passing on a tradition. The study shows that family firms on their own have a special "financial logic" due to the personal preferences of the management. The analysis indicates that there are differences between family and non-family firms regarding preferences for risk, ownership, and growth which are the drivers behind their financial logic (Gallo, Tàpies, & Cappuyns, 2004). To create a better understanding of the financial logic behind family firms, this research focuses more specifically on the preferences regarding risk-taking behavior. In the current literature, results are mixed and theoretical findings about the differences in risk-taking behavior between family- and non-family firms are not always consistent. Some studies indicate

that family firms behave more risk averse than non-family firms, due to degree of own resources invested and to avoid bankruptcy. In contrast, other studies argue that family firms are willing to take more risks than non-family firms because of the long-term orientation and independence from financial markets (Kempers, Kammerlander, & Leitterstorf, 2019). However, these inconclusive findings may be due to the inconsistencies in the use of factors, such as the type of firms and family influence, considered in earlier analyses (Miralles-Marcelo, Miralles-Quirós, & Lisboa, 2014). This research will consider the most important firm- and financial characteristics that influence their risk-taking behavior and eventually have an impact on how family firms make financing decisions.

Many studies conducted on family firms investigate firm performance. The major objective of those researches is to examine how family ownership, management, and control influences the performance of the firm relative to non-family firms. Investigating risk-taking behavior views family firms from a different perspective. Thereby, prior studies focused mainly on family firm behavior and their effects in the American market or more country specific. Focusing on the European market fills a gap in the literature. The wider scope of this research allows to capture potential effects of the institutional environment. Most studies conducted on family firms focus on the US or another particular country in the world. However, there are significant differences between the ownership landscape of Europe and the US. According to La Porta, Lopez-de-Silanes, and Schleifer (1999), the concentration of corporate ownership differs around the world. The American ownership landscape is more dispersed than in Europe. High dispersion allows managers a degree of power over the direction of a firm. This might lack to create incentives to perform direct monitoring in comparison with Europe, where there are incentives to conduct direct monitoring and temptations to extract private benefits. Prior studies argue that the institutional environment, such as the law and investor protection, financial policy, and accounting information in different countries influences the corporate governance structure (La Porta, Lopez-de-Silanes, & Schleifer, 1999). There is a relationship between legal protection and ownership concentration, which may also influence family firm behavior.

The remainder of the thesis is organized into four chapters. In chapter 2, the relevant literature is discussed, and hypotheses are formulated. Chapter 3 gives an overview of the data and research method used in the study. The empirical results are presented in chapter 4. Finally, chapter 5 is the concluding chapter of this research.

2. Literature Review

In current societies, people experience dealing with risk as an important concern of everyday life. According to Zinn (2017), risk is broadly referred to as: "The uncertainty that an outcome or investment's actual return will differ from the expected outcome or return". The concept of risk describes the insurance against possible losses, and the most accurate calculation of the costs and benefits involved. Different situations and perspectives can lead to different definitions of risk-taking. According to social researches, it is important to understand the perception of people, responses to, and taking of risk. This is crucial when analyzing risk-taking behavior. Two fundamental dimensions in risk-taking behavior are, among other aspects, the concept of control and identity. Reasons why people take risks is accompanied with their level of control. When having full-control, risk-taking provides a powerful and positive identity. It can be seen as part of further developing a valued identity. Besides that, there is evidence that identity is an important driver to take risks. People take risks to develop and protect their identity in two ways: actively seeking and managing risks but also developing and maintaining positive identity (Zinn, 2017).

In family firms, family is the central component of the firm which makes the organizational identity unique. The organizational identity can be seen as the framework which guides family firm behavior, strategic as well as financial behavior. This affects how managers shape the external image of the firm and develop their reputation (Memili, Eddleston, Kellermanns, Zellweger, & Barnett, 2010). The family identity is impossible to completely copy and therefore the organizational identity may be the key source of competitive advantage (Zellweger, Eddleston, & Kellermanns, 2010). Thereby, the level of control is also of great importance in family firms. Family involvement in management is the key determinant of the family's desire to guard family control in the firm (Neckebrouck, Manigart, & Meuleman, 2017). This indicates that risk-taking behavior in family firms is valuable to consider, since both dimensions – control and identity – are crucial elements of the family firm. The risk that family firms take is a critical factor in financial planning for the business and family because risk-taking behavior directly influences the financial decisions of these firms (Xiao, Alhabeeb, Hong, & Haynes, 2001). Firms, in general, experience different types of risks. One of the most common form is business risk. Part of this risk is industry related, which reflects the change in the competitive landscape of firms. Technological, economic, and social changes can influence the firm's business. Another

part of this risk is firm related, which reflects the unique qualities of any firm. In family firms, this is of major importance since they have intangible qualities that create the "familiness" in the firm. The idiosyncratic assets, cultures, and managerial processes might provoke uncertainty. The "familiness" quality can be a source of the uncertainty in their business (Zahra, 2005). One of the most risky decisions faced by family firms, is the intermingling between the family and external financing. The level of risk-taking along with the financial capabilities and long-term goals of the family firm influences these decisions (Xiao, Alhabeeb, Hong, & Haynes, 2001). Existing literature demonstrates differences regarding external financing behavior and the capital structure of family firms and non-family firms. Financing decisions of family and non-family firms are not likely to be the same, since family firms are often controlled by a shareholder with large undiversified stakes. Therefore, these decisions might rather be influenced by the dominant shareholders' incentives than those of diversified shareholders in non-family firms. The study of Crocci, Doukas, and Gonenc (2011) on European family firms, shows that debt is preferred over equity financing due to the importance of control (Crocci, Doukas, & Gonenc, 2011). However, the results of prior studies that investigate whether family firms use more or less debt are diverse and inconclusive. Whereas Anderson and Reeb (2003) found that family control in the US does not significantly influence the firm's financing decision, a study of González et al. (2013) on Colombian firms shows that the level of debt in the firm depends on whether and how families are involved in the firm (Anderson & Reeb, 2003; Gonzáles, Guzmán, Pombo & Trujillo, 2013). Also, Mishra and McConaughty (1999) found evidence that US family firms use a significantly lower level of debt for two reasons. First, to avoid the loss of control in the firm and second, to decrease the likelihood of bankruptcy (Mishra & McConaughty, 1999). Ampenberger et al. (2013) corroborate the view that family firms are different. However, they found new evidence that the institutional context is important. Whereas most prior studies found higher debt ratios for family firms, the opposite is true for bank-based financial systems. Their study focused on German family firms and found that family firms avoid debt but choose higher equity ratios (Ampenberger, Schmid, Achleitner, & Kaserer, 2013). More will be explained later in this chapter when discussing the potential impact of the institutional environment on firm behavior.

In the subsequent paragraphs, we describe the various relationships that are being investigated in this research. We discuss the current literature on the relationships of investigation and based on the literature review of this chapter, a central research question has been formulated.

2.1. Risk-Taking Behavior and Family Involvement

As discussed earlier in the literature review, risky decisions faced by firms are affected by the level of risk-taking. Whether and how risk-taking behavior of family firms differs from non-family firms, may be explained when comparing both classifications. Many researchers investigating family firms and firm performance agree that family involvement in the business is what makes the family firm different (Chu, 2011; Lee, 2006; Villalonga & Amit, 2006). However, this leads us to the following question: "What does family involvement actually mean?" As Le Breton-Miller et al. (2011, p.707) noted, "family influence may be a function of diverse things such as the family presence, need for interaction, conflict, and emotional content". These may be driven by conditions such as the number and power of family members involved in the business, the distribution of their ownership, and the participation of multiple generations in the firm (Le Breton-Miller, Miller, & Lester, 2011). Family involvement is therefore typically categorized by three components in many studies. Including the study of Villalonga and Amit (2006), who used three fundamental elements in the definition of family involvement: ownership, management and control. To understand whether family firms can create or destroy value, it is important to differentiate among these crucial elements. Family firms can be small businesses and sole proprietorships, but also large public corporations. Most family businesses are a combination of ownership by few and concentrated shareholders. This is in contrast to non-family firms, that are often owned by many shareholders (Lee, 2006). The stewardship theory is becoming very popular in family firm studies. This theory shows that managers act as stewards of the assets they control. In family firms this might be an important aspect as well, due to the fact that they care about longevity and continuity of the firm. They invest in the development of the business on the long-term and benefit of the family members (Miller, Le Breton-Miller, & Scholnick, 2008). When family members act as stewards instead of agents, their active involvement in top management may be advantageous (Chu, 2011). But how is involvement of the family in terms of ownership, management, and control in the firm related to risk-taking behavior? Contradictory results arise from prior studies of risk-taking in family firms. Anderson and Reeb (2003) argue that the level of risk-taking may be lower than in other contexts. Due to high desire for firm survival and undiversified nature of holdings, they have strong incentives to minimize risk (Anderson & Reeb, 2003). Whereas Xiao et al. (2001) on the other hand, claim that family owners are willing to take more financial risks relative to non-family owners. However, as

opposed to other types of firms, risk-taking in family firms is associated with the awareness of family wealth, which is also referred to as their socio-emotional wealth (SEW), that might be at stake as well as the social wellbeing of further generations. Thereby, the family name and reputation may be damaged when taking too much risk (Naldi, Nordqvist, Sjöberg, & Wiklund, 2007). In light of this, the hypothesis (*H1*) is formulated as follows: *family involvement in terms of ownership, management, and control is negatively associated with risk-taking behavior.*

2.2. Differences Family and Non-Family Firms

Different characteristics distinguish family firms from non-family firms. These characteristics can be categorized as either firm- or financial-related characteristics, and potentially influence the level of risk-taking of family firms. The typical characteristics of interest are discussed in the following subsections. Several hypotheses are drawn from the existing literature.

2.2.1 Firm Characteristics

At first, growth of any firm creates new opportunities for managers. According to the study of Daily and Dollinger (1992), managers in non-family firms tend to develop and implement more active growth-oriented strategies compared to family firms. Managers of non-family firms are likely to promote high rates of growth, since they want to run larger firms (Daily & Dollinger, 1992). Family firms tend to commit fewer resources to R&D projects than non-family firms. This might lead to less innovative products or services and limited sales growth (Wang & Poutziouris, 2010). The strategic preference of family firms can be explained by their favor of objectives related to creation of SEW (family wealth) and long-term orientation (Mahto & Khanin, 2015). According to the study of Donckles and Fröhlich (1991) on European family firms, they are more inclined to find that innovation involves too much risk. Creativity and innovation are considered less important. Family firms disagree with the statement that managers must encourage risky innovations and thereby, they are less growth oriented. One of the most important consequences of this, is that most family firms are rather risk-averse (Donckels & Fröhlich, 1991). The hypothesis (*H2*) is formulated as follows: *growth and innovation are negatively associated with risk-taking behavior of family firms.* Thereby, another important firm-related characteristic of the family firm is board size. In contrast to non-family firms, board capital is an important aspect for family firms. Board capital consists of human capital, which includes experience, knowledge,

skills, and reputation, but also of social capital, which includes the sum of potential resources from their network or relationships. Board size is an important determinant of board capital. The larger the board, the wider will be the provision of both skills and organizational links to the firm (Corbetta & Salvato, 2004). According to Kogan and Wallach (1964), the size of the decision-making group decreases its propensity to take risk. When there are few investment opportunities, approval of a large board will reduce the number of risky projects. There are few alternative projects to replace the rejected ones by the board, thus the firm is likely to decrease risk-taking (Nakano & Nguyen, 2012). The hypothesis (*H3*) is formulated as follows: *board size is negatively associated with risk-taking behavior of family firms.*

2.2.2 Financial Characteristics

Besides diverging firm characteristics, family firms and non-family firms also differ from a financial perspective. Differences exist regarding firm performance, the investment horizon, and the level of diversification. According to studies of Burkart, Panunzi and Schleifer (2002), Anderson and Reeb (2003) and Lee (2006), firms with active family involvement tend to perform better financially. Thereby, firms would perform even better if the founding family member participates in the management of the firm (Lee, 2006). However, as Miller et al. (2007) discuss in their research, out-performance of family firms is a result of how these businesses were defined. Thereby, differences in performance exist among large publicly listed and small private family firms, which makes it risky to generalize this statement to all family businesses (Miller, Le Breton-Miller, Lester, & Canella Jr., 2007). Nevertheless, prior studies have shown that firms may strongly react to whether or not they have performed as expected. According to the behavior theory of the firm, they continually adjust their behavior their behavior in reaction to past performance. Firms can become more risk seeking when they incurred losses. However, Matho and Khanin (2015) found that especially family firms often exhibit more caution and decrease their risk exposure following prior success. Therefore, the hypothesis (*H4*) is formulated as follows: *firm performance is negatively associated with risk-taking behavior of family firms.* Furthermore, family owners tend to maintain a longer investment horizon and invest more efficiently than other shareholders. This may be due to the fact that the family views their business as an important resource, which they want to pass on to succeeding generations. The longer outlook of family firms implies a more vital role of firm survival, relative to the myopic investment decisions of other shareholders who focus on the boost of short-term earnings (Lee,

2006). Anderson, Duru, and Reeb (2012) argue that families have strong incentives to choose investments that are more long-term oriented and ensure the health of the firm (Anderson, Duru, & Reeb, 2012). In light of this, the hypothesis (*H5*) is formulated as follows: *the investment horizon is negatively associated with risk-taking behavior of family firms.* Despite the longer investment horizon, family firms prefer lower levels of diversification both domestically and internationally relative to non-family firms. The most prominent determinant is the desire to maintain the familiness from a strong personal affection, commitment, and identification with the firm (Anderson & Reeb, 2003). The family firm aims to protect their SEW, which is an important factor in determining the level of diversification in such firm. Therefore, relative to firms with more diversified shareholders, family firms diversify less. Due to the concentration of the family's wealth in a single organization, these firms are less willing to take risks (Gomez-Mejia, Makri, & Kintana, 2010). The hypothesis (*H6*) is formulated as follows: *the level of diversification is positively related to risk-taking behavior of family firms.*

2.3. Institutional Environment

According to paragraph 2, there are crucial elements that distinguish family firms from non-family firms. However, external factors might also play an important role. Ampenberger et al. (2013) discuss the institutional environment in their article, which can be a critical element to consider as well. According to standard financial theory, financial systems tend to be bank-based or either market-based, depending on the overall financial development of the country involved. The study of Ampenberger et al. (2013) focused on family firms in Germany, which contains a bank-based system. Banks are likely to exercise control over firms they finance. Therefore, the findings of this study suggest including the institutional environment in further studies, since the behavior of family firms might vary regarding the differences in control of banks over firms. When creditors are well protected, and thus credit rights are strong, the risk-taking propensity of firms may decrease. Creditor rights reduce managers' willingness to undertake risky projects (Ampenberger, Schmid, Achleitner, & Kaserer, 2013). Besides the potential impact of creditor rights, it might also be possible that the capability of the legal regime plays an important role (Chu, 2011). In the finance literature, there is evidence for a negative relationship between investor protection and risk-taking. However, investors protection might vary varies across countries (John, Litov, & Yeung, 2008).

2.4. Research Question

The research question of this study is formulated as follows: "Does family involvement affect risk-taking behavior of European firms, and to what extent do specific firm- and financial characteristics of the family firm change the relationship?"
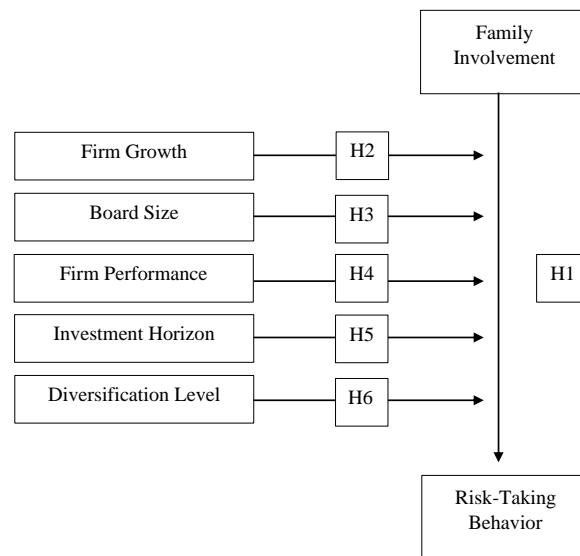
FIGURE 1. CONCEPTUAL MODEL

3. Dataset & Methodology

This chapter describes the data and sample, the variables, and the methodology used in this research. The first paragraph explains the data and the sample selection. Paragraph 2 provides the descriptive statistics and operationalization of the variables. The final paragraph describes the methodology; the data analysis strategy to test the hypotheses and the econometric models.

3.1. Data Sources and Sample Selection

The final sample consists of 236 European publicly listed family and non-family firms over the year 2018. The 17 counties involved in this research are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom (UK). Company-specific data of each firm is acquired via the databases Orbis and BoardEx. Financial data of the financial year 2018 is retrieved via the database Thomson Reuters (Eikon). Data with respect to the institutional environment of each European country in 2018 has been obtained via the database of the World Bank. The World Bank designed the "Doing Business" Databank, which offers economic data of business regulations from 2003 to the present. The database is especially relevant for making comparisons of countries or regions. The chosen period is the most recent period that the databases provide. Due to limited data availability of private firms, this research focuses on publicly listed firms only. Firms with limited data availability were still dropped from the sample. To run the analyses, it is important to give a clear definition of the family firm and further specify the sample selection process of non-family firms. This is done in the subsequent subsections.

3.1.1 Family Firm Definition

As argued in the study of Harms, family firm business research gets more and more accepted as an independent field of study in economics. However, one potential issue regarding this topic is the definition of the family firm (Harms, 2014). Every year, Ernst and Young (EY) and the Center of Family Business of the University of St. Gallen publishes the Global Family Business Index, called the FB500. This index provides significant insights into the world's largest family-owned businesses. The index creates an overview and tracks the geographical distribution of 500 privately and publicly listed family businesses ranked by revenues.

The methodology of the Global Family Business Index is as follows. Firms are considered as a family firm if they meet the following criterions. First, the business must be run by the second generation or more. Second, one or more family members must be involved in running the business, i.e. be part of either the board of directors or executive leadership (CEO). Third, the family should have significant ownership in the firm. The total shareholding by the family members in this research varies from 33 to 100 percent. According to the FB500 list, 110 European family firms were left to include in the sample. A dummy variable (*family*) has been created that equals one if the firm is a family firm and zero otherwise. Appendix A provides the list of family firms considered in this research including the family name, country, and industry they are active in. Developers of the Global Family Business Index saw a substantive rise in Germany based firms and slight reduction in American firms. This again is a good reason to investigate the European market more deeply.

3.1.2 Non-Family Firm Definition

The list of European non-family firms has been randomly drawn from the database Orbis. To make sure the sample of non-family firms would be comparable to the list of family firms, the list of non-family firms is partially based on the same ranges of firm age, firm size, industry activities, and country of the family firms involved. An overview of the ranges applied to draw the random sample of non-family firms can be found in appendix A. Again, only publicly listed firms are included to ensure data availability. Based on the selection procedure, potentially 944 publicly listed non-family firms found in Orbis were left to include in the sample. More detailed information about the selection procedure can be found in appendix B. To ensure approximately as many family and non-family firms in the final sample, a subsample of non-family firms has been drawn in Stata based on stratified random sampling. Finally, 126 non-family firms are considered in this study. Appendix B provides a list of the firms including country and industry.

TABLE 1. DISTRIBUTION TYPE OF FIRM

		Frequency	Percentage
Type of Firm	Family	110	46.61
	Non-Family	126	53.39
	Total	236	100.00

Notes: distribution of European firms. *Source:* author calculations in Stata.

3.2. Operationalization of the Variables

The operationalization of the variables refers to how specific variables are defined and measured as it is used in this research. The variables in this research can be classified as either dependent, independent, moderating, or control variables. The full overview of the definitions per variable can be found in appendix C.

3.2.1 Dependent Variables

In this research, two measures of risk-taking behavior are considered. First, the financing decision, which indicates how a firm finances its overall operations and growth by using different sources of funds. To measure the financial structure of firms, the debt-to-equity ratio (*DE*) per firm in the year 2018 has been used as the dependent variable. This ratio is calculated by dividing debt by equity. Many analysts use the D/E ratio to compare the financial structure with other firms. According to financial theory, as the usage of debt in a firm's capital structure rises, so does the risk the firm is facing. This indicates a higher leverage ratio and more aggressive capital structure (Copeland & Weston, 1983). Table 2 gives an overview of the descriptive statistics of the dependent variables. As demonstrated below, the average D/E ratio of family firms is lower than the average debt-to-equity ratio of non-family firms. The average D/E ratio of family firms is 0.923, which means the liabilities of the firm are 92.3% of stockholders' equity. In general, as the D/E ratio of a firm increases, firm risk increases because the probability of default increases from the view of investors and lenders. It suggests that the firm has financed a larger amount of its growth through borrowing (Anderson, Mansi, & Reeb, 2003). However, what is considered high ratio can depend on the industry of the firm for example. Differences between industries exist regarding the usage of debt financing.

TABLE 2. DESCRIPTIVE STATISTICS DEPENDENT VARIABLES

	All firms		Family firms		Non-Family firms	
	Mean	Standard dev.	Mean	Standard dev.	Mean	Standard dev.
Variable						
Debt-to-equity	1.081	2.888	0.923	1.643	1.220	3.645
Z-score	3.206	3.419	3.657	4.450	2.812	2.093
Z-score"	3.730	8.282	4.389	11.874	3.153	2.295
Observations (N)	236		110		126	

Source: database Eikon Thomson Reuters.

The second measure of firm risk-taking behavior is the Altman Z-score (*zscore*). The Z-score is a numerical measurement used in statistics, which measures the overall financial health and presents the likelihood of a firm to declare bankruptcy. The score is comprised of five financial ratios, which can be found below. Calculations of the Z-score has been made based on financial data of 2018. Equation 1 provides the formula to calculate the Altman Z-score.

$$(1)\ Zscore = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E$$

A	Working Capital to Total Assets
B	Retained Earnings to Total Assets
C	Earnings before Interest and Taxes (EBIT) to Total Assets
D	Market Capitalization to Total Liabilities
E	Sales to Total Assets

Notes: Input ratios for the calculation of the Original Altman Z-score.

As Vaknin (2010) discusses in his research, it is important to look at factors beyond leverage that reflects overall risk. Therefore, the Z-score is an appropriate measure to use since it generates a complete picture of the risk profile of family firms (Vatkin, 2010). In the current literature, the Altman Z-score has not been investigated extensively yet in family firm research. Prior studies of D'Aurizio, Oliviero, & Romano (2015) and Crespí & Martín-Oliver (2015) on family firms did use the Z-score but focused on the usage of external financing during the financial crisis. In addition to the Z-score, the Z-score" has been analyzed as well. The same has been done in the study of Vatkin (2010). This score is a development of the original Altman Z-score, which fits better to non-manufacturing firms (Vatkin, 2010). Equation 2 provides the formula of the Z-score" and the considered ratios in the calculation can be found below as well.

$$(2)\ Zscore'' = 6.58A + 3.26B + 6.72C + 1.05D$$

A	Working Capital to Total Assets
B	Retained Earnings to Total Assets
C	Earnings before Interest and Taxes (EBIT) to Total Assets
D	Shareholders' Equity to Total Liabilities

Notes: Input ratios for the calculation of the additional Z-score (Z-score"), used for non-manufacturing firms.

As mentioned, the Altman Z-score is a measure of risk that indicates the likelihood of a firm to declare bankruptcy. When the score is below 1.8, this means that it is likely that the firm is headed for bankruptcy, while firms with scores above 3.0 are not likely to go bankrupt. As shown in table 2, the Z-score of family firms is on average better relative to non-family firms. This would indicate that family firms are less likely to declare bankruptcy than non-family firms and are thus less risky. The same result yields for the Z-score". The variation in scores between family and non-family firms might be due to different views on bankruptcy of business-owners. As Gallo and Vilaseca (1996) argue in their study, family firms rather perceive business bankruptcy the same as a personal one. They do not want to bear personal or social costs of losing everything and thus tend to avoid higher levels of risk (Gallo & Vilaseca, 1996).

3.2.2 Independent Variables

As we aim to investigate the effect of the family on risk-taking behavior, family involvement is denoted in several ways. Villalonga and Amit (2006) analyzed how family ownership, management, and control affect firm value. They included family shareholders, family vote-holders, family directors or officers, and interaction effects of those variables in their research. Anderson and Reeb (2003) focused more on different levels of family ownership. They developed a binary variable when the family firm has an equity stake in the company, added the fractional equity holdings of the founding family, and the dollar value of equity held by the family. The study of Crocci et al. (2011) also added a variable which indicates if the firm is managed by a CEO or chairman who is a family member. Taken this together, in this research, family involvement is denoted in three ways: family shareholding, family board, and family CEO. Table 3 summarizes the descriptive statistics of the family involvement variables. Those variables are considered as independent variables in this research.

First, a general dummy variable has been created (f*amily*) that equals one if the firm is family firm and zero otherwise. In this research, 110 firms are considered as family firm and the 126 firms are classified as non-family firm. The variable family shareholding (*FS*) denotes to what extent the family has an equity stake in the firm, measured as the fractional equity holdings by the family. The statistics indicate that families own at least 33% of the shares (or more) of the firm. According to the study of La Porta et al. (1999) on corporate ownership around the world, if shareholders own and control more than 50 percent of the shares of a company, they are typified as majority shareholders. This gives a person, entity, or family (in this case), significant influence

over the direction of the company. If the majority shareholder is a key stakeholder, this might influence the business operations and strategic direction of the company (La Porta, Lopez-de-Silanes, & Schleifer, 1999). Therefore, this research further investigates the potential influence of majority shareholding by family firms more deeply. Two additional variables have been created. First, a dummy variable (*FS1*) which equals one if the family holds less than 50 percent of the shares. Second, a dummy variable (*FS2*) which equals one if the family holds more than 50 percent of the shares. According to the statistics, in 31 family firms, the family owns less than 50 percent of the shares. In 79 family firms, the family owns more than 50 percent of the shares, which can be typified as majority shareholding by the family. Another dummy variable has been created that indicates family involvement in terms of participation in the management. The dummy variable family board (*FB*) equals one if family members participate in the board of the firm and zero otherwise. The statistics indicate, in 105 family firms, the family actively participates in the board. Finally, a dummy variable has been generated (*FCEO*) that equals one if the current chairman or CEO is a family member and zero otherwise. According to the statistics, in 70 of the 110 family firms, a family member is appointed as CEO or director of the company.

TABLE 3. DESCRIPTIVE STATISTICS FAMILY INVOLVEMENT VARIABLES

Variable	N	Percentage	Mean	Standard Dev.	Min.	Max.
Family shareholding	110	100.00	0.572	0.166	0.33	1.00
Equity stake < 50%	31	28.18			0	1
Equity stake ≥ 50%	79	71.82			0	1
Family board	110	100.00			0	1
Family members	105	95.45			1	1
Non-family members	5	4.55			0	0
Family Chairman/CEO	110	100.00			0	1
Family Chairman/CEO	70	63.64			1	1
External Chairman/CEO	40	36.36			0	0

Source: database BoardEx.

3.2.3 Moderating Variables

In statistics, moderation occurs when the relationship between two variables depends on a third variable. In this research, we are interested in the potential relationship between the family involvement and risk-taking behavior of firms. However, the relationship between family involvement and risk-taking behavior might change as indicated in the literature review of chapter 2. Firm characteristics, such as the growth rate and board size of the firm, but also

financial characteristics, such as performance, the investment horizon, and the level of diversification, might have an impact on risk-taking. Therefore, several moderator variables have been added in this research to identify the potential impact on risk-taking behavior in combination with family involvement. A moderator variable (commonly denoted as *M*) is thus an extra variable involved that affects the strength of the relationship between the dependent and independent variable. Table 4 summarizes the descriptive statistics of the moderating variables. In this research, firm growth and innovation (*growth*) is measured as the one-year annual growth rate of the net sales or revenues of the company from 2017 to 2018. Both family and non-family firms have an average annual growth rate around 9%. The size of the board (*boardsize*) is measured as the total number of current directors in the firm in 2018. There seem to be differences between family and non-family firms regarding the size of the board. The statistics indicate that, on average, the board size in non-family firms is higher than in family firms. Family firms have an average size of 12 members in their board, whereas non-family firms have an average board size of 26 members.

The financial characteristics considered in this research are firm performance, the investment horizon, and level of diversification. Literature on firm performance uses numerous methods to determine the performance. In this research, we use the two most common measurements: return on equity (*ROE*) and return on assets (*ROA*). Both performance indicators are kind of the same for both groups. On average, the return on equity of non-family firms is higher than the average return on equity of family firms. Return on equity of 15-20% are generally considered good. However, this also depends on the industry group or business segment where a firm is active in. To investigate the potential influence of the investment horizon, we look at the long-term investments of each firm. Long-term investments are measured as the sum of R&D- and capital expenditures. Normalizing the long-term investments as a fraction of total assets allows us to compare across firms (Anderson, Duru, & Reeb, 2012). Therefore, the investment horizon (*investhor*) of the firm is measured as the sum R&D- and capital as a fraction of the total assets. This variable indicates that the average long-term investments of all firms are around 5.3% of the total assets of the company. The same yields for the level of diversification. Corporate diversification (*segments*) is measured as the total number of current business segments or industries, which is determined by counting the number of secondary SIC codes. Looking at the level of diversification of both groups, family firms are on average active in more business

segments than non-family firms. However, on average, they are both active in around 2 business segments and industries. The investment horizon and level of diversification does not differ that much between both groups. The values are quite interesting, since the current literature clearly indicates differences regarding the investment horizon and level of diversification between family and non-family firms.

TABLE 4. DESCRIPTIVE STATISTICS MODERATING VARIABLES

Variable		N	Mean	Standard Dev.	Min.	Max.
Growth (1-year %)	All firms	236	0.093	0.237	-0.584	2.596
	Family firms	110	0.092	0.213	-0.132	2.029
	Non-family firms	126	0.094	0.257	-0.584	2.596
Board size	All firms	236	19.619	21.076	4	268
(number of members)	Family firms	110	12.373	4.962	4	28
	Non-family firms	126	25.944	26.964	5	268
Return on equity (%)	All firms	236	0.133	0.208	-1.068	2.103
	Family firms	110	0.121	0.169	-1.068	0.622
	Non-family firms	126	0.144	0.238	-0.464	2.103
Return on assets (%)	All firms	236	0.059	0.062	-0.256	0.399
	Family firms	110	0.061	0.060	-0.189	0.337
	Non-family firms	126	0.057	0.064	-0.256	0.399
Investment horizon (%)	All firms	236	0.053	0.043	0	0.283
	Family firms	110	0.051	0.040	0	0.227
	Non-family firms	126	0.054	0.045	0	0.283
Level of diversification	All firms	236	1.932	1.243	1	10
(number of segments)	Family firms	110	2.109	1.273	1	7
	Non-family firms	126	1.778	1.199	1	10

Source: Eikon Thomson Reuters.

3.2.4 Control Variables

In the data analyses, we control for industry-, firm- and country-specific attributes. Firm size (*size*) is measured as the firm's total employees and firm age (*age*) is measured as the number of years since the foundation of the firm. As the measures were relatively large compared with other measures in the study, we used the natural logarithmic transformation of both variables. Industry (*SIC3*) is measured as the primary industry activities, the three-digit Standard Industry Classification. The descriptive statistics of the control variables are summarized in table 5. The statistics show that, on average, family firms are older than non-family firms. Thereby, non-family firms are, on average, smaller than family firms. The SIC industry classification codes vary from 102 to 874, which indicates that the firms of interest in this research operate in a wide

array of industries. Appendix D provides an overview of the industry classifications and the distribution of firms by SIC division. Appendix A and B, the lists of family and non-family firms, also show the industry classifications per firm. Most firms are prevalent in the manufacturing sector. Many family firms can also be found in wholesale and retail trade, or the financing, insurance and real estate sector. The industry dummy included 7 different categories, representing the industry sectors corresponding to the SIC codes. An overview of the 7 categories can be found in appendix D.

TABLE 5. MEAN VALUES CONTROL VARIABLES

Variable	All firms	Family firms	Non-family firms
Firm age (in years)	79	96	65
Firm size (in employees)	37774	46313	30318
Observations (N)	236	110	126

Notes: total number of observations (N) is 236. *Source:* Eikon Thomson Reuters and Orbis.

Besides the firm- and financial characteristics considered in this research, the potential impact of relevant external factors is studied as well. To investigate the influence of the institutional environment on firm risk-taking behavior, we control for both creditor- and minority shareholder protection. The World Bank designed different measures per country (World Bank, 2019). First, in cooperation with United Nations Commission on International Trade Law (UNCITRAL) and the International Monetary Fund (IMF), the Insolvency and Creditor Rights (ICR) Standard has been developed. This standard is recognized as one of the key standards for sound financial systems. The getting credit index is part of the standard and used as a measure for creditor protection in this research. The getting credit index (*creditor*) measures the access to finance and the legal rights on a scale of 0 to 12. This index illustrates the degree of collateral and bankruptcy laws protecting the rights of borrowers and lenders and thus facilitate lending. Besides the ICR Standard, the World Bank also provides data of minority investor protection. This topic measures the strength of minority shareholder protections against directors that use corporate assets for their personal gain as well as shareholder rights, governance safeguards, and corporate requirements that reduce risk of abuse. The strength of minority investor protection index (*shareholder*) is used as a measure for shareholder protection in this research. The index measures the overall shareholder protection for each country on a scale of 0 to 10. Table 6 gives

an illustration of the statistics of both control variables. The values are based on the countries part of this study. The countries involved are discussed in paragraph 3.1 of this research. The institutional environment indicators are discrete variables that can only take on particular real values. The creditor rights index ranges from 0 to 12. The countries involved in this study score between 2 and 8, and on average 5. The minority shareholder rights index ranges from 0 to 10. The countries of this study score between 7 and 10, and on average 8. Appendix D provides a more detailed overview of the rating of creditor rights, minority shareholder rights, and the particular financial system (*financialsys*) per country.

TABLE 6. DESCRIPTIVE STATISTICS INSTITUTIONAL ENVIRONMENT VARIABLES

Variable	N	Mean	Standard Dev.	Min.	Max.
Creditor rights	236	5.123	1.685	2	8
Minority shareholder rights	236	8.110	1.034	7	10

Notes: the statistics are based on the 17 involving countries in the study. *Source:* The World Bank.

3.3. Methodology Design

Two quantitative research methods have been conducted during this research, the matched pairs design and Ordinary Least Squares (OLS) regression analysis. Allouche et al. (2008) used the matched pairs research design in their analysis on family firms in Japan. This methodology systematically compares family firms and non-family firms that have the same profile. Pairs of firms have been established with respect to firm size and industry. In this manner, factors of risk-taking variance have been neutralized (Allouche, Amann, Jaussaud, & Kurashina, 2008). Firm size is a continuous variable, measured as the total number of employees. Therefore, rules for trading off the closeness of the match on one with the closeness of the match on the other is pre-specified. The ratio that has been used to determine the matched pairs is 1.3. In other words, the determined range of firm size is 30%. Based on the list of 110 family firms (identified from the Family Business Index FB500) and the list of 944 non-family firms (identified from the random draw in Orbis), 43 pairs have been identified. The matched pairs are as close as possible to each other with respect to size and industry activities. To analyze the matched pairs, a paired sample Student t-test is required. The test compares the mean values of both groups to ascertain statistical difference. The outcomes of the tests indicate whether differences between family and non-family firms exist. The econometric model is required to meet several crucial assumptions:

the variables of interest must be measured on a continuous scale, observations must be independent of each other, variables should be approximately distributed and not contain outliers. The independent variable must consist of two categorical, related groups or matched pairs. Related groups ensure ending up with the same subjects present in both groups, which are firm size and industry in this case. To run the test, differences between the two paired samples and the sample mean of the differences must be calculated (μ_d). In the test, the null hypothesis assumes that true difference between the paired samples is zero. Conversely, the alternative hypothesis assumes that the difference between the mean of the paired samples is not equal to zero. The representations, in mathematical terms, of the hypotheses are defined as follows:

$$H_0 : \mu_d = 0$$
$$H_1 : \mu_d \neq 0$$

The second research design is a multiple Ordinary Least Squares (OLS) regression analysis. The main relationship of interest is the effect of family involvement on risk-taking behavior. As we want to check whether firm-characteristics, such as growth and board size, but also financial characteristics, such as performance, the investment horizon, and the level of diversification have a weaker or stronger effect for family firms, they have been added as moderated variables in the analysis. Therefore, moderated regression analysis has been used, which is a regression-based technique to identify the moderator variables. An interaction effect between an independent variable and moderator variable must be added to the model. If the variable is statistically significant, the variable is a moderator variable and thus moderation is supported. OLS regression analysis with cross-sectional data is employed in this study. The regression can be expressed as:

$$(3)\ Risk\ Taking_i = \beta_0 + \beta_1 (FamilyFirm_i) +$$
$$\Phi(Moderating\ variables_i\ \&\ Control\ Variables_i) + \varepsilon_i \text{ for firm } i = 1, \dots, 236$$

Where:

$Risk\ Taking$ = measures of risk-taking

$Family\ Firm$ = measures of family involvement

$Moderating\ Variables$ = variables that moderate relationship between family and risk-taking

$Control\ Variables$ = variables that potentially affect risk-taking

ε = the random error

4. Main Findings

This chapter presents the empirical results of the research. The main findings are divided in two parts. The first paragraph discusses the results of the matched pairs Student t-tests. Paragraph 2 examines the results of the Ordinary Least Squares (OLS) regression analyses. Answers to the hypotheses are formulated in both paragraphs.

4.1. Matched Pairs Results

As discussed in the methodology design (paragraph 3.3), 43 pairs of family and non-family firms have been identified. In the matched pairs tests, we look at the differences between the measures of risk-taking. Therefore, matched pairs student t-tests have been conducted on the dependent variables of this research, the Z-score(s) and debt-to-equity ratio. An overview of the results can be found in the table below.

TABLE 7. MATCHED PAIRS STUDENT T-TEST RESULTS

Variable	N	Means			Std. Dev.	t-value	Significance
		Family firms	Non-family firms	Difference			
Debt-to-equity	43	0.609	1.013	-0.404	0.343	-1.2	0.246
Z-score	43	3.104	3.666	-0.561	0.795	-0.7	0.484
Z-score"	43	2.922	2.962	-0.041	0.536	-0.1	0.940

Notes: *** Significant the at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations in Stata.

The results are insignificant, which is peculiar since the current literature on family firm behavior clearly states that differences exist between risk-taking behavior of family- and non-family firms. Thereby, the results with respect to the Z-score(s) differ from the mean values earlier indicated in table 2. Despite the fact that a slightly different dataset has been used, the results from the matched pairs student t-tests are not in line with earlier results. In the above table the average Z-score(s) of family firms are lower than for non-family firms, while the mean values in table 2 suggest the opposite. The other measure of risk-taking, the debt-to-equity ratio, shows results in line with the literature review in chapter 2 of this research. However, the effects of the differences in risk-taking between family firms and non-family firms are insignificant, which means there is not enough evidence from this model to support the first hypothesis (*H1*).

4.2. OLS Regression Results

To identify how particular variables are correlated to each other and possible relationships exist, correlation matrixes have been composed. As indicated in table 8, most independent variables with respect to family involvement show moderate to strong correlation. The study of Crocci et al. (2011) discusses the importance of differences within family firms in their article on external financing behavior. Since we are interested in how the different levels of family involvement influence risk-taking behavior, the potential impact of the family is captured by two alternative variables. In this way we are able to see whether the effect of family involvement is enhanced if we look at multiple variables. First, an interaction effect between family shareholding ($\geq$ 50 percent) and family CEO has been created. This variable (*FS2FCEO*) examines the effects on risk-taking when the family owns more than 50 percent of the shares and the CEO is a family member. Second, an interaction effect between family shareholding ($\geq$ 50 percent) and family board has been created. This variable (*FS2FB*) examines the effects on risk-taking when the family owns more than 50 percent of the shares and family members participate in the board.

In addition, another correlation matrix has been established. The matrix includes all variables investigated in this study, and can be found in appendix F. The correlation matrix shows strong positive correlation between the return on assets (*ROA*) and one of the risk-taking measures (*zscore*). However, return on assets (*ROA*) is moderate but negatively correlated with the other measure of risk-taking (*DE*). Board size is moderate but negatively correlated with the general family firm dummy (*family*). Finally, the performance indicators have a strong correlation with each other. This is logically explainable since both variables are measures of performance. Therefore, in further analyses, both measures have not been used simultaneously.

TABLE 8. CORRELATION MATRIX FAMILY INVOLVEMENT VARIABLES

	family	**FS1**	**FS2**	**FB**	**FCEO**
family	1.000				
FS1	0.416	1.000			
FS2	-0.416	-1.000	1.000		
FB	0.958	0.359	-0.359	1.000	
FCEO	0.695	0.297	-0.297	0.632	1.000

Notes: total number of observations (N) is 236. correlation coefficient of ±0.50 to ±1.00 indicates strong correlation, of ±0.30 to ± 0.50 indicates moderate correlation, and ±0.10 to ±0.30 indicates weak correlation between two variables
Source: Author calculations in Stata.

If we look at the VIF test in appendix G, it is possible to conclude that there is no multicollinearity in this research. The following has been analyzed and examined in this paragraph. At first, we aim to study the effect of family involvement on risk-taking behavior of firms. Secondly, the potential effects of the moderating variables (as explained in subsection 3.2.3) on risk-taking behavior of family firms have been investigated. Finally, we control for several important other factors that might influence risk-taking behavior such as firm age, firm size, the industry activities, and the institutional environment. Five different regression models have been developed to test the influence of different levels of family involvement on risk-taking behavior. The empirical results from can be found in table 9 and 10; table 9 includes the Altman Z-score results and table 10 includes the debt-to-equity ratio results. To ensure correct interpretation of the regression coefficients, it is important to clearly state what risk-taking means with respect to the debt-to-equity ratio and Z-score. As indicated in subsection 3.2.1, an increase in DE ratio suggests a more aggressive capital structure because the probability of a default increases due to a higher level of debt financing (Mishra & McConaughty, 1999). Therefore, we consider a higher DE ratio as a higher level of risk-taking while a higher Z-score means less risk-taking. A higher Z-score suggests that a firm is less likely to declare bankruptcy and thus is less risky (Vatkin, 2010). First, a general model has been developed to simply test the effects of the firm- and financial characteristics on both risk-taking measures. In this model, we look at risk-taking behavior more generally and do not take into consideration family involvement yet. In the subsequent models the firm- and financial characteristics are further investigated in combination with the family involvement variables to test the moderating effects on risk-taking behavior. In model I, only the variables board size and return on assets are significant. The results show that an increase in the board size leads to an increase in the level of risk-taking as well. This is not consistent with the study of Nakano and Nguyen (2012). In their research, board size appears to be associated with lower risk-taking due to the difficulty of convincing a large group of peers to make controversial decisions. The performance indicator return on assets (*ROA*) suggests that an increase in performance leads to less risk-taking. This is also supported by the study of Bromiley (1991), stating that once a firm starts performing poorly, it will keep getting worse and worse. Alternatively, high performers can keep earnings higher and high returns are associated with less risk (Bromiley, 1991). The other variables in this model do not show significant results with respect to both measures of risk-taking.

TABLE 9. RESULTS ALTMAN Z-SCORE

Linear regression summary

	Altman Z-score				
	I	**II**	**III**	**IV**	**V**
Family (dummy)		-0.777*	0.659	-0.263	0.346
		(-1.70)	(1.35)	(-0.51)	(1.63)
Family shareholding * Family CEO			0.236*		0.254*
			(1.72)		(1.84)
Family shareholding * Family board				0.119	
				(0.71)	
Growth	0.061	-0.414**	-0.265	-0.244	-0.225
	(0.14)	(-2.37)	(-1.27)	(-1.17)	(-1.17)
Board size	-0.040**	-0.040**			
	(-2.21)	(-2.36)			
Return on equity (ROE)				-0.207	-0.182
				(-0.27)	(-0.23)
Return on assets (ROA)	7.812***	6.409***			
	(7.20)	(5.10)			
Investment horizon	0.013	0.107	0.042	0.057	
	(0.20)	(1.50)	(0.34)	(0.48)	
Level of diversification	0.020		0.133***		0.130***
	(0.83)		(2.84)		(2.81)
Family * Growth		1.093**	1.869***	1.672***	1.556***
		(2.28)	(4.85)	(3.99)	(5.13)
Family * Board size		0.070			
		(0.67)			
Family * ROE				2.315**	2.259**
				(2.53)	(2.52)
Family * ROA		3.482*			
		(1.74)			
Family * Investment horizon		-0.125	0.095	0.004	
		(-1.21)	(0.68)	(0.03)	
Family * Diversification			-0.141*		-0.135*
			(-1.86)		(-1.80)
Creditor rights			0.062*		0.066*
			(1.79)		(1.92)
Shareholder rights				-0.068	
				(-1.43)	
Firm age			0.165*	0.207**	0.163*
			(1.97)	(2.59)	(1.95)
Firm size			-0.192***	-0.174***	-0.183***
			(-4.23)	(-3.77)	(-4.07)
Constant	0.475*	0.931***	1.541**	2.416**	1.305**
Industry Dummy Included	No	No	Yes	Yes	Yes
Number of observations (N)	235	235	225	225	225
Adjusted R-squared	0.374	0.425	0.312	0.214	0.436

Notes: the table shows the regression results from the OLS regression models with the Z-score as the dependent variable. The first cluster represents the family involvement variables used as independent variables, the second cluster includes the moderating variables, the third cluster represents the control variables and in the final cluster some general statistics have been presented. T-statistics can be found in the parentheses under coefficient. Robust standard errors have been used in the regression models to overcome the problem of heteroskedasticity. The use of robust standard errors does not change the coefficient estimates but the test statistics give more reasonably accurate p-values. ***Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations in Stata.

TABLE 10. RESULTS DEBT-TO-EQUITY RATIO

Linear regression summary

	Debt-to-equity Ratio				
	I	**II**	**III**	**IV**	**V**
Family (dummy)		0.630	-1.977**	-0.263	-0.659
		(0.69)	(-2.08)	(-0.51)	(-1.68)
Family shareholding * Family CEO			-0.355*		-0.374*
			(-1.14)		(-1.18)
Family shareholding * Family board				0.119	
				(0.71)	
Growth	-0.661	0.093	0.086	-0.244	0.161
	(-0.75)	(0.29)	(0.28)	(-1.17)	(0.66)
Board size	0.080***	0.080**			
	(2.66)	(2.60)			
Return on equity (ROE)				-0.207	0.716
				(-0.27)	(1.08)
Return on assets (ROA)	-7.762***	0.632			
	(-3.97)	(0.345)			
Investment horizon	0.123	0.098	0.118	0.057	
	(0.81)	(0.52)	(0.63)	(0.48)	
Level of diversification	-0.001		-0.177		-0.170
	(-0.02)		(-1.52)		(-1.47)
Family * Growth		-2.220**	-2.712***	-1.672***	-2.262***
		(-2.24)	(-2.65)	(-3.99)	(-2.66)
Family * Board size		-0.019			
		(-0.67)			
Family * ROE				2.315**	-2.593**
				(2.53)	(-2.23)
Family * ROA		-2.381**			
		(-1.93)			
Family * Investment horizon		-0.071	-0.398	0.040	
		(-0.31)	(-1.62)	(0.03)	
Family * Diversification			0.284*		0.275*
			(1.85)		(1.79)
Creditor rights			-0.135**		-0.133**
			(-2.36)		(-2.21)
Shareholder rights				-0.068	
				(-1.43)	
Firm age			-0.054	-0.207**	-0.048
			(-0.37)	(-2.59)	(-0.33)
Firm size			0.255***	0.174***	0.237***
			(3.20)	(3.77)	(2.93)
Constant	0.095	0.253	1.240	2.416**	1.513
Industry Dummy Included	No	No	Yes	Yes	Yes
Number of observations (N)	228	228	228	228	228
Adjusted R-squared	0.128	0.192	0.260	0.145	0.171

Notes: the table shows the regression results from the OLS regression models with the debt-to-equity ratio as the dependent variable. The first cluster represents the family involvement variables used as independent variables, the second cluster includes the moderating variables, the third cluster represents the control variables and in the final cluster some general statistics have been presented. A full description of all variables can be found in Appendix C. T-statistics can be found in the parentheses under coefficient. Robust standard errors have been used in the regression models to overcome the problem of heteroskedasticity. The use of robust standard errors does not change the coefficient estimates but the test statistics give more reasonably accurate p-values. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations in Stata.

4.2.1 Family Involvement and Risk-Taking Behavior

In model II we take into consideration the most general level of family involvement, which is the dummy for the family firm. As can be seen in table 9 and 10, the family dummy is only significant with respect to the Altman Z-score. This model shows that, after the effects of other variables are taken into consideration, the Z-score of family firms is 0.777 lower relative to non-family firms. As indicated, a lower Z-score suggest a higher level of risk-taking. Looking at the most general definition of the family firm, the results from this model would suggest that family firms take more risks than non-family firms. However, in table 10 we see that the family firm dummy is not significant with respect to the debt-to-equity ratio. Therefore, only looking at this level of family involvement might not be sufficient enough. The study of Zahra (2005) also found some support for the fact that more general family involvement in terms of ownership and management promotes risk-taking, while long CEO or founder tenures lead to the opposite (Zahra, 2005). Therefore, in model III the family firm has been further defined. The interaction effect (*FS2FCEO*) between majority family shareholding and family CEO has been taken into consideration, as indicated earlier in this paragraph. As can be seen in table 9 and 10, for both measures of risk-taking, the interaction effect is significant. This means, the further we define the family firm, the more impact family involvement has on the level of risk-taking. The interaction effect shows if majority of the firm's shares are held by the family and the CEO is a family member, the level of risk-taking decreases. This in contrast to the previous model, where the relationship between the Altman Z-score and the family dummy was positive. One possible explanation is the relatedness between the propensity of risk-taking and equity ownership in the company. This is supported by the view of Eisenhardt (1989), Beatty and Zajac (1994), and Denis and Sarin (1997), who suggest that an increase in ownership in the firm leads to risk aversion. This is consistent with the predictions based on the agency theory (Eisenhardt, 1989; Denis, Denis & Sarin, 1997; Batty & Zajac, 1994). Model IV again further defines the level of family involvement. In this model, we take into consideration the interaction effect (*FS2FB*) between majority family shareholding and family board. As can be seen in table 9 and 10, the interaction effect is not significant with respect to both measures of risk-taking. The result is contrasting to the previous model where the interaction between majority family shareholding and family CEO (*FS2FCEO*) does have an impact on the level of risk-taking. The result is quite strange as we would expect, in accordance with the literature, if the family holds majority of the

shares and the family participates in the board this has an influence on risk-taking as well. However, it seems to be that family firms with majority shareholding by the family and a family member CEO have more power than family board member participation. We suggest therefore that the power of the family is restricted in the latter case. In accordance with Model III and IV, we consider the second family dummy (*FS2FCEO*) as the most important level of family involvement and sufficient power by the family. Therefore, an additional regression model has been created (model V). In both models the family firm dummy (*FS2FCEO*) is significant. Again, this model suggests that majority shareholding by the family and a family member CEO is the most powerful level of family involvement with respect to risk-taking behavior in this research. In the first hypothesis (*H1*), we proposed the relationship between family involvement and the level of risk-taking to be negative. The results indicate that we can support the hypothesis, however depending on the level of family involvement considered in the model.

4.2.2 Moderation Effects

In models II to V, the moderating variables have been added to this regression model. Besides the investigation of the relationship between family involvement and the level of risk-taking, we also want to check whether the firm- and financial characteristics potentially moderate this relationship. As indicated in section 3.2.3, several interaction effects have been added to both regression models. Since we are dealing with interaction effects, we do not look at the main effects but at the coefficients of the interaction terms. In a family firm, the annual growth rate (*growth*) has a reinforcing impact on firm risk-taking behavior. According to table 9, if the firm is a family firm and the growth rate increases, this positively influences the Altman Z-score. In other words, if the annual growth rate of the family firm increases, the level of risk-taking is lower. Table 10 shows a negative relationship, which yields the same result because a lower debt-to-equity ratio means less risk-taking. As indicated in both studies of Daily and Dollinger (1992) and Donckles and Fröhlich (1991) on strategic behavior and firm objectives, growth and innovation are considered less important to family firms and business owners. Family firms do not encourage risky growth-oriented objectives, and therefore take less risks. This is supported by the results of this research because in all models the interaction effect is significant. In the hypothesis (*H2*) we suggest a negative relationship between growth and the level of risk-taking of family firms. This hypothesis is supported by the empirical results of this research.

Return on assets (*ROA*) and return on equity (*ROE*), i.e. performance of the firm, also seem to moderate the relationship between family and the level of risk-taking. In all models, both performance indicators show significant results. As Matho and Khanin (2015) have argued in their study, this can be explained by the fact that family firms often exhibit more caution with respect to risk exposure when following prior success (Mahto & Khanin, 2015). This means we can fully support the hypothesis (*H4*).

We also see that the level of diversification (*segments*) moderates the effect between family involvement and the level of risk-taking. The interaction effect is significant with respect to both measures of risk-taking. In the hypothesis (*H6*) we proposed a positive relationship between the level of diversification and risk-taking of family firms. The results indicate that, in line with the existing literature, a higher level of diversification increases risk-taking behavior of family firms. As indicated by the studies of Gomez-Mejia et al. (2006; 2010), the level of diversification always poses a dilemma: allowing firm risk to be spread means carrying a higher likelihood of SEW loss. Family firms want to protect their SEW and are therefore willing to accept threats to firms' financial well-being (i.e. more concentrated level of risk) in order to prevent SEW losses. This implies that family firms are willing to incur more risk in order to preserve that wealth. Thus, an increase in the level of diversification means a higher level of risk-taking. This is supported by the empirical results of this research and therefore we support the hypothesis (*H6*).

As can be seen in table 9 and 10, the results with respect to the variables board size (*H3*) and investment horizon (*H5*) are not significant. Therefore, we do not have enough evidence to support the remaining hypotheses. However, as shown in model I, the boar size appears to have an impact on firm risk-taking. Nevertheless, the effect is not stronger for family firms, since the interaction effect is not significant. Therefore, we only partially support the hypothesis (*H3*).

4.2.3 Institutional Environment and other Controls

In addition, we control for some other factors that might have an impact on risk-taking behavior of firms. In model III to V, we control for firm age, firm size, industry, and the institutional environment. Controlling for firm age and firm size seems to be important for the level of risk-taking. The level of risk-taking might be different for younger, smaller or older and bigger firms. For instance, new or smaller ventures might react differently or adjust their behavior in contrast to more established, older and mature businesses. According to the results in table 9 and 10, an increase in age decreases the level of firm risk-taking. However, the variable

does not show significant results in all models. Nevertheless, the results with respect to firm size are strongly significant and suggest that an increase in size leads to an increase in risk-taking. This suggests that bigger firms take more risks relative to smaller firms. As mentioned in subsection 3.2.1, we also evaluate an additional measure of the Altman Z-score (*zscore*"). This measure is a better fit for non-manufacturing firms. Additional regression analyses have been conducted with this measure as a dependent variable. As indicated earlier in this research, most firms in the sample are prevalent in the manufacturing sector. However, the results are quite similar to the results with the original Z-score measure. We could not find contradictory results when controlling for the industry activities of the firms. On the other hand, controlling for the institutional environment, minority shareholder rights do not have a significant effect on risk-taking behavior in this research. Only the level of creditor protection seems to play a role. As indicated in the literature view of chapter 2, control of banks varies across countries. As can be seen in table 11, creditor protection is (on average) lower in bank-based systems than in market-based systems. Majority of the firms in this research are part of a bank-based system, namely 158 firms. In countries with a more bank-based system, banks are more likely to exercise control over the firms they finance. They may play a major role in case of financial distress by monitoring and restructuring when required. In such institutional settings, control considerations lead to different outcomes of risk-taking. As Ampenberger et al. (2013) already suggest in their study, high creditor protection (i.e. strong creditor rights) leads to less firm risk-taking. This is also supported by the results of this research, which can be found in table 9 and 10. The results indicate that an increase in the creditor rights index leads to a decrease in the debt-to-equity ratio and increase in the Altman Z-score. In both cases this suggest that firm risk-taking decreases. A possible explanation can be that firms tend to avoid debt, and thus avoid more risk, in an environment in which creditor monitoring and protection is tight (Ampenberger, Schmid, Achleitner, & Kaserer, 2013). Thus, in countries with a bank-based system, i.e. stronger creditor rights, the level of risk-taking is lower. This is supported by the results in the following tables.

TABLE 11. CREDITOR PROTECTION

	Creditor protection (0-12)	Observations (N)
Bank-based system	4.013	158
Market-based system	5.671	78

Notes: the table shows the mean values of the creditor rights index with respect to the financial system (bank-based versus market-based). *Source:* The World Bank.

TABLE 12. FINANCIAL SYSTEM

	Z-score	Debt-to-equity	Observations (N)
Bank-based system	3.399	1.010	158
Market-based system	2.815	1.226	78

Notes: the table shows the mean values of the measures of risk-taking with respect to the financial system. *Source:* The World Bank and Eikon Thomson Reuters.

According to the results of this chapter, we find enough evidence to support majority of the hypotheses developed in the literature review of chapter 2. The negative relationship between family involvement (*H1*) and risk-taking behavior has been established. Firm growth (*H2*), firm performance (*H4*), and the level of diversification (*H6*) indeed moderate this relationship. However, there is not enough evidence to say that board size and the investment horizon of the firm moderate the relationship between family involvement and risk-taking behavior. Therefore, we cannot fully support the remaining hypotheses (*H3* and *H5*).

5. Conclusion

The unique characteristics that distinguish family firms from non-family firms are a popular research topic and debate by many researchers in the field of economics. One of the main significant differences between the family firm and non-family firm is the level of risk-taking. It is generally believed that risk-taking in family firms is associated with the awareness of family wealth, socio-emotional wealth (SEW). The wealth of the family is of great importance because this is accompanied with the social wellbeing of future generations. Therefore, we would suggest that family firms are willing to take less risks relative to non-family firms. However, there are several characteristics significantly impacting the relationship between the relationship between the family and level of risk-taking. Following that logic, the goal of this this research was to answer the following questions: Does family involvement affect risk-taking behavior of European firms? And to what extent do specific firm- and financial characteristics change the relationship between family involvement in the firm and the level of risk-taking? Based on data of 236 firms in Europe, including 110 family firms and 126 non-family firms, this study found a negative relationship between family involvement and the level of firm risk-taking. This indicates that family firms often take less risks in comparison to non-family firms. As mentioned, one of the most important and prevailing explanations for this phenomenon is the protection of socio-emotional wealth (SEW), the dominant paradigm of the family firm. Family firms focus to a great extent on further developing a valued identity, and the level of risk-taking has a major influence on this aspect. However, as clearly stated by the results and findings of previous chapter, risk-taking behavior of the family firm really depends on the level of family involvement in the firm. In this study, a distinct definition of the family firm is given. A firm has been categorized as a family firm if they meet the following criteria; the business must be at least run by the second generation, one (or more) family members must be involved in running the business or the family should have a substantial equity stake in the business. We have tested for different levels of involvement by the family. Looking at a more general definition of the family firm, we were not able to show concrete differences regarding firm risk-taking behavior of family and non-family firms. Therefore, we conclude that the influence of the family on risk-taking behavior instantly depends on the power of the family itself. Family involvement seems to be most powerful when the family owns more than 50% of the shares of the firm, i.e. majority shareholding by the

family, and the CEO is a family member. In other cases, we agree that the power of the family is restricted and does not have enough impact on the level of risk-taking. Thus, to answer the main question of this research, we conclude that family involvement does have an effect on risk-taking behavior of European family firms. However, the effect of the family is most powerful in case the family members own more than 50% of the shares and a family member is active as CEO.

Besides, the objective of this study was to identify firm- and financial characteristics that moderate the relationship between the family and risk-taking behavior. The characteristics of interest in this study are the striking features that distinguish family firms from non-family firms. As noted in the current literature, these characteristics moderate the relationship between the family firm and their level of risk-taking. The firm-related characteristics investigated were firm growth and board size. The financial-related characteristics investigated were firm performance, the investment horizon of the firm, and the level of diversification. According to the results of this study, only firm growth, firm performance, and the level of diversification moderate the relationship between family involvement and the level of risk-taking by the firm. Firm growth negatively influences risk-taking behavior of family firms, indicating that the moderating effect is stronger for these firms. We can say that the family firm is less growth-oriented, and this negatively influences their risk-taking behavior. This also holds for firm performance. Firm performance negatively influences risk-taking behavior of family firms, indicating that the moderating effect is stronger for these firms. If their performance is better, this means their level of risk-taking decreases. Finally, the level of diversification changes the relationship between the family and risk-taking. As mentioned, the relationship between the family firm and risk-taking behavior is negative, but this changes if the level of diversification increases. A higher diversified family firm takes on more risks.

The institutional environment has also been investigated in this study. The results in the previous chapter show that only the level of creditor protection has an effect on the level of firm risk-taking. As indicated, in a more bank-based system, the level of firm risk-taking is lower relative to a more market-based system. In a bank-based system creditor rights are stronger and thus creditors are better protected. For firms, this tend to be a good reason to decrease their level of risk-taking. They would rather choose to avoid debt in this case.

Limitations

Although the results of this research provide more insight into risk-taking behavior of family firms, some limitations remain. More measures with respect to family involvement in the firm could have been taken into consideration in the research. Other studies use, for example, the number of generations of the family involved, the percentage of voting rights by the family members, or more characteristics of the family members in the management/CEO such as education, age, and gender. This would give a more broader view of family involvement and the impact on risk-taking behavior of the firm. However, taken into consideration those measures in our research would require a change in the methodology design. A survey, for example, would be more appropriate to gain data in this case. The second limitation has to do with the sample size. By using the list of FB500 list of EY & Center of Family Business of the University of St. Gallen, there is a somewhat limited sample size. According to the list, there are a lot of private family firms. Taken into consideration those private companies might lead to more accurate results. Finally, there are also many studies conducted on family firms using panel data in their researches. The advantage of panel data over cross-sectional data is the more informative nature of panel data since it includes more information distinguishing between fixed and random effects. With the usage of panel data, it would be possible to investigate multiple entities (family and non-family firms in this case) in which outcomes and characteristics are observed in multiple points in time. This could also give more accurate results with respect to risk-taking behavior.

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Appendices

Appendix A. Family Firms

FIRM AGE, FIRM SIZE, INDUSTRY OF FAMILY FIRMS

	Mean	Min	Max
Variable			
Firm age (years)	95.7034	15	351
Firm size (employees)	46313.26	935	664496
Industry (3-digit SIC)		102	874

Notes: number of observations (N) is 110. The 110 family firms considered in this research have a minimum firm age of 15 years and maximum firm age of 351 years. The number of employees ranges from 935 to 664496 employees in the firm. The 3-digit Standard Industry Classification (SIC) ranges from 102 to 874. Based on these ranges, a random draw of European non-family firms has been made in the database Orbis. *Source:* database Thomson Eikon Reuters.

FREQUENCY TABLE FAMILY FIRMS PER COUNTRY

	Frequency (number)	Percentage (%)
Country		
Austria	2	1.82
Belgium	11	10.00
Denmark	2	1.82
Finland	1	0.91
France	20	18.18
Germany	18	16.36
Greece	3	2.73
Italy	9	8.18
Luxembourg	2	1.82
Netherlands	7	6.36
Norway	1	0.91
Poland	2	1.82
Portugal	3	2.73
Spain	9	8.18
Sweden	4	3.64
Switzerland	10	9.09
United Kingdom (UK)	6	5.45
Total	110	100.00

Notes: number of observations (N) is 110. The table gives an overview of the geographical distribution of the European family firms involved in this research. Source: database Orbis.
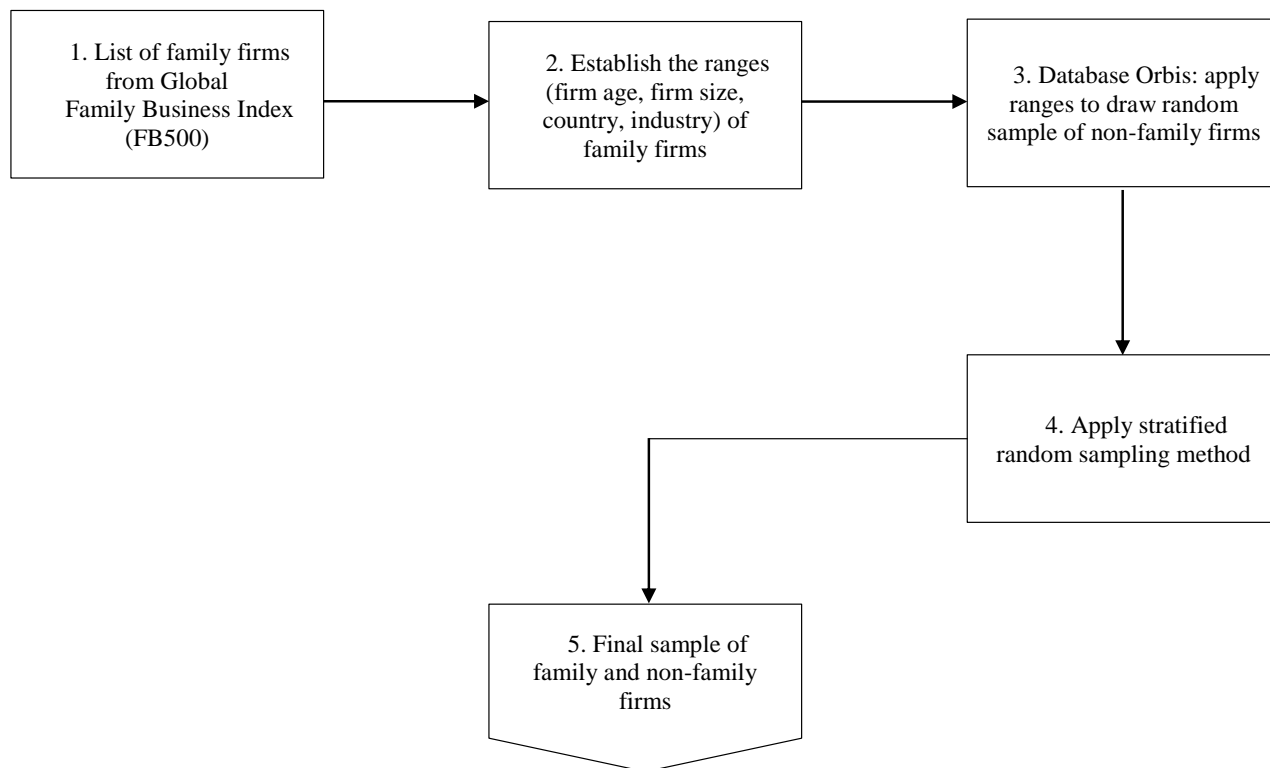
Company name	Family name	Country	3-digit Standard Industry Classification (SIC)
A.P. Møller - Mærsk A/S	Moeller	Denmark	473: Freight Transportation Arrangement
Acciona, SA	Entrecanales	Spain	152: Residential Building Construction
Ackermans & van Haaren	Bertrand and van	Belgium	162: Heavy Construction, Except Highway
Aker ASA	Rokke	Norway	138: Oil and Gas Field Services
Altice Europe NV	Drahi family	Netherlands	489: Communications Services
Antofagasta PLC	Luksic/Fontbona	UK	102: Copper Ores
Astaldi SpA	Astaldi	Italy	154: Nonresidential Building Construction
Axel Springer SE	Springer, Döpfner	Germany	271: Newspapers
Bakkavör Group PLC	Gudmundsson	UK	209: Miscellaneous Food and Kindred Products
Barry Callebaut AG	Jacobs	Switzerland	206: Sugar and Confectionery Products
Bechtle AG	Schick	Germany	737: Computer and Data Processing Services
Beiersdorf AG	Herz family	Germany	284: Soap, Cleaners, and Toilet Goods
BMW AG	Quandt and Klatten	Germany	371: Motor Vehicles and Equipment
Bollore Participations SA	Bollore	France	671: Holding Offices
Bucher Industries AG	Hauser	Switzerland	289: Miscellaneous Chemical Products
Burelle SA	Burelle	France	308: Miscellaneous Plastic Products
Buzzi Unicem SpA	Buzzi	Italy	324: Cement, Hydraulic
Casino Guichard Perrachon	Naouri family	France	541: Grocery Stores
Cofide-Gruppo de Benedetti SpA	De Benedetti family	Italy	271: Newspapers
Coloplast A/S	Louis-Hansen	Denmark	384: Medical Instruments and Supplies
Compagnie Financière Richemont SA	Rupert	Switzerland	391: Jewelry, Silverware, and Plated Ware
Continental Aktiengesellschaft	Schaeffler	Germany	301: Tires and Inner Tubes
Cyfrowy Polsat SA	Zak	Poland	573: Radio, Television, and Computer Stores
Danieli & C. Officine Meccaniche SpA	Danieli	Italy	354: Metalworking Machinery
Dart Group PLC	Meeson	UK	451: Air Transportation, Scheduled
Dassault Aviation SA	Dassault	France	372: Aircraft and Parts
D'Ieteren SA	D'Ieteren	Belgium	501: Motor Vehicles, Parts, and Supplies
DKSH Holding AG	Keller family	Switzerland	738: Miscellaneous Business Services
Drägerwerk AG & Co. KGaA	Draeger	Germany	382: Aircraft and Parts
Droege Group (ALSO Holding AG)	Droege	Switzerland	504: Professional & Commercial Equipment
Econocom Group SA/NV	Bouchard	Belgium	737: Computer and Data Processing Services
Ellaktor SA	Kallitsantsis	Greece	154: Nonresidential Building Construction
Eramet SA	Duval	France	106: Ferroalloy Ores, Except Vanadium
Etex SA	Emsens	Belgium	503: Lumber and Construction Materials
Etn. Fr. Colruyt NV	Colruyt	Belgium	541: Grocery Stores
Eurocash SA	de Amaral	Poland	509: Miscellaneous Durable Goods
Eurofins Scientific SE	Martin	Luxembourg	873: Accounting, Auditing, and Bookkeeping
Exor NV	Agnelli	Netherlands	671: Holding Offices
Ferrovial, SA	Del Pino	Spain	162: Heavy Construction, Except Highway
Fomento de Construcciones y Contratas, SA	Koplowitz	Spain	161: Highway and Street Construction
Fuchs Petrolub SE	Fuchs	Germany	299: Miscellaneous Petroleum and Coal Products
Gestamp Automoción, SA	Riberas	Spain	371: Motor Vehicles and Equipment
Greenyard NV	Deprez	Belgium	203: Preserved Fruits and Vegetables
Grenke AG	Grenke	Germany	615: Business Credit Institutions
Groupe Bruxelles Lambert SA	Desmarais and Frère	Belgium	615: Business Credit Institutions
Groupe Crit SA	Guedj	France	736: Personnel Supply Services
Groupe LDC SA	Lambert, Chancereul,	France	201: Meat Products
Groupe SEB	Lescure	France	509: Miscellaneous Durable Goods
Heineken Holding NV	Heineken and Hoyer	Netherlands	208: Beverages
HELLA GmbH & Co. KGaA	Hueck	Germany	364: Electric Lighting and Wiring Equipment
Hellenic Petroleum SA	Latsis	Greece	131: Crude Petroleum and Natural Gas
Henkel AG & Company, KGaA	Henkel	Germany	284: Soap, Cleaners, and Toilet Goods
Hennes & Mauritz AB	Persson	Sweden	565: Family Clothing Stores
Hermès International SA	Hermes	France	232: Men's and Boys' Furnishings
Hornbach Holding AG & Co. KGaA	Hornbach	Germany	531: Department Stores
Hunter Douglas NV	Sonnenberg	Netherlands	249: Miscellaneous Wood Products
Iliad SA	Niel	France	737: Computer and Data Processing Services
Imerys SA	Desmerais and Frère	France	149: Miscellaneous Nonmetallic Minerals
Industria de Diseno Textil SA	Ortega	Spain	232: Men's and Boys' Furnishings
Investor AB	Wallenberg family	Sweden	671: Holding Offices
JCDecaux Holding	Decaux	France	671: Holding Offices
Jerónimo Martins, SGPS, SA	Soares dos Santos	Portugal	541: Grocery Stores
Kering SA	Pinault	France	531: Department Stores
Knorr-Bremse AG	Thiele	Germany	671: Holding Offices
KONE Oyj	Herlin	Finland	353: Construction and Related Machinery
Krones AG	Pasquier and Metz	Germany	671: Holding Offices
Kuehne + Nagel International AG	Kuehne	Switzerland	449: Water Transportation Services
L E Lundbergforetagen AB	Lundberg	Sweden	653: Real Estate Agents and Managers

Liberty Global PLC	Malone family	UK	484: Cable and Other Pay TV Services
L'OREAL SA	Bettencourt Meyers	France	284: Soap, Cleaners, and Toilet Goods
Luxottica Group SpA.	Del Vecchio	Italy	385: Ophthalmic Goods
LVMH Moët Hennessy Louis Vuitton S.E.	Arnault	France	233: Women's and Misses' Outerwear
Mayr-Melnhof Karton AG	Mayr Melnhof	Austria	263: Paperboard Mills
Mediaset SpA	Berlusconi	Italy	484: Cable and Other Pay TV Services
Meliá Hotels International, SA	Escarrer	Spain	701: Hotels and Motels
Merck KGaA	Merck	Germany	283: Drugs
Mota-Engil, SGPS, SA	Mota	Portugal	161: Highway and Street Construction
Motor Oil (Hellas) Corinth Refineries SA	Vardinoyannis	Greece	291: Petroleum Refining
NV Bekaert SA	Bekaert	Belgium	331: Blast Furnace and Basic Steel Products
Obrascon Huarte Lain SA	Villar Mir	Spain	161: Highway and Street Construction
OCI NV	Sawiris	Netherlands	287: Agricultural Chemicals
PORR AG	Ortner	Austria	152: Residential Building Construction
Porsche Automobil Holding SE	Porsche-Piech family	Germany	371: Motor Vehicles and Equipment
Prada SpA	Prada	Italy	319: Leather Goods
Prosegur Compañia de Seguridad SA	Revoredo	Spain	738: Miscellaneous Business Services
Randstad NV	Goldschmeding	Netherlands	671: Holding Offices
Ratos AB	Söderberg	Sweden	671: Holding Offices
Roche Holding AG	Hoffman and Oeri	Switzerland	283: Drugs
Salini Impregilo SpA	Salini	Italy	162: Heavy Construction, Except Highway
Saras SpA.	Moratti	Italy	291: Petroleum Refining
Schindler Holding AG	Schindler and Bonnard	Switzerland	353: Construction and Related Machinery
Schroders PLC	Schroder and	UK	671: Holding Offices
Sika AG	Burkard-Schenker	Switzerland	289: Miscellaneous Chemical Products
Sixt SE	Sixt	Germany	751: Automotive Rentals, No Drivers
Sligro Food Group NV	Slippens family	Netherlands	514: Groceries and Related Products
Société BIC SA	Bich	France	395: Pens, Pencils, Office, and Art Supplies
Sodexo SA	Bellon	France	581: Eating and Drinking Places
Solvay SA	Solvay	Belgium	283: Drugs
Sonae, SGPS, SA	Azevedo	Portugal	531: Department Stores
Sports Direct International PLC	Ashley	UK	594: Miscellaneous Shopping Goods Stores
Técnicas Reunidas, SA	Urrutia	Spain	131: Crude Petroleum and Natural Gas
Tenaris SA	Rocca	Luxembourg	331: Blast Furnace and Basic Steel Products
The Swatch Group AG	Hayek	Switzerland	387: Watches, Clocks, Watchcases, and Parts
Trigano SA	Feuillet	France	371: Motor Vehicles and Equipment
UCB SA	Janssen	Belgium	283: Drugs
Unibel SA	Fievet	France	202: Dairy Products
United Internet AG	Dommermuth	Germany	737: Computer and Data Processing Services
Viohalco SA/NV	Stassinopoulos	Belgium	359: Industrial Machinery
Volkswagen AG	Porsche and Piech	Germany	371: Motor Vehicles and Equipment
Wendel-Participations SE	Wendel	France	671: Holding Offices

Notes: number of observations (N) is 110. The table provides the list of family firms involved including the family name, country en industry where the firm is active in. Source: database Orbis and FB500 list.

Appendix B. Non-Family Firms

Selection procedure to draw the random sample of non-family firms is organized as follows:

```
┌──────────────────┐     ┌──────────────────┐     ┌──────────────────┐
│ 1. List of family│     │ 2. Establish the │     │ 3. Database Orbis:│
│ firms from Global│ ──▶ │ ranges (firm age,│ ──▶ │ apply ranges to  │
│ Family Business  │     │ firm size,       │     │ draw random      │
│ Index (FB500)    │     │ country, industry)│     │ sample of non-   │
│                  │     │ of family firms  │     │ family firms     │
└──────────────────┘     └──────────────────┘     └──────────────────┘
                                                            │
                                                            ▼
                                                  ┌──────────────────┐
                           ┌──────────────────── │ 4. Apply         │
                           │                     │ stratified random│
                           │                     │ sampling method  │
                           ▼                     └──────────────────┘
                  ┌──────────────────┐
                  │ 5. Final sample  │
                  │ of family and    │
                  │ non-family firms │
                  └──────────────────┘
```

SAMPLE SELECTION PROCEDURE OF NON-FAMILY FIRMS

In step 1, the list of family firms is set up based on the Global Family Business Index (FB500). An overview of the family firms considered in this research can be found in the previous appendix (appendix A). To ensure comparability, the list of non-family firms is based on the same ranges of firm age, firm size, industry activities, and countries of the family firms involved. These ranges are established in step 2 of the selection procedure and can also be found in the previous appendix. In step 3, we apply the ranges of family firms to draw a random sample of non-family firms in the database Orbis. A list of 944 non-family firms remains from the random draw. These firms were left to include in the sample to run the regression analyses. The geographical distribution the 944 non-family firms can be found in the following table:

FREQUENCY TABLE NON-FAMILY FIRMS

Country	Frequency (number)	Percentage (%)
Austria	24	2.54
Belgium	17	1.80
Denmark	31	3.28
Finland	44	4.66
France	85	9.00
Germany	128	13.56
Greece	17	1.80
Italy	48	5.08
Luxembourg	10	1.06
Netherlands	44	4.66
Norway	21	2.22
Poland	49	5.19
Portugal	6	0.64
Spain	35	3.71
Sweden	72	7.63
Switzerland	72	7.63
UK	241	25.53
Total	944	100.00

Notes: the table gives an overview of the geographical distribution of the total list of 944 non-family firms to include in the sample. Source: database Orbis.

The objective is to have a comparable dataset containing approximately as many family and non-family firms. Based on stratified sampling, a subsample of non-family firms has been created in step 4. Stratified sampling is a sampling method in which the total dataset is already subdivided into subcategories. The dataset has already been divided in two main categories: family and non-family firms. We aim to include all 110 publicly listed family firms in the sample. Therefore, a simple random sample has been drawn from the list of 944 non-family firms. The table below gives an overview of the geographical distribution of the final sample.

FINAL SAMPLE: NUMBER OF FAMILY AND NON-FAMILY FIRMS PER COUNTRY

Country	Family	Percentage	Non-family	Percentage	Total
Austria	2	1.82	3	2.38	5
Belgium	11	10.00	5	3.97	16
Denmark	2	1.82	3	2.38	5
Finland	1	0.91	2	1.59	3
France	20	18.18	12	9.52	32
Germany	18	16.36	21	16.67	39
Greece	3	2.73	2	1.59	5
Italy	9	8.18	3	2.38	12
Luxembourg	2	1.82	0	0.00	2
Netherlands	7	6.36	6	4.76	13
Norway	1	0.91	6	4.76	7
Poland	2	1.82	8	6.35	10
Portugal	3	2.73	2	1.59	5
Spain	9	8.18	6	4.76	15
Sweden	4	3.64	6	4.76	10
Switzerland	10	9.09	8	6.35	18
UK	6	5.45	33	26.19	39
Total	110	100.00	126	100.00	236

Notes: the table gives an overview of the geographical distribution of the final sample, including both family and non-family firms considered in this research. Source: database Orbis.

Company	Country	3-digit Standard Industry Classification (SIC)
Aalberts Industries NV	Netherlands	349: Miscellaneous Fabricated Metal Products
Abeo SA	France	509: Miscellaneous Durable Goods
Accell Group NV	Netherlands	375: Motorcycles, Bicycles, and Parts
Acerinox, SA	Spain	331: Blast Furnace and Basic Steel Products
Acs Actividades De Construccion Y Servicios, SA	Spain	154: Nonresidential Building Construction
Adidas AG	Germany	302: Rubber and Plastics Footwear
Aeroports De Paris SA	France	458: Airports, Flying Fields, and Services
Airbus SE	Netherlands	372: Aircraft and Parts
Akzo Nobel NV	Netherlands	283: Drugs
All For One Steeb AG	Germany	737: Computer and Data Processing Services
Amplifon SpA	Italy	384: Medical Instruments and Supplies
Ams AG	Austria	367: Electronic Components and Accessories
Arkil Holding A/S	Denmark	161: Highway and Street Construction
Asseco Poland SA	Poland	737: Computer and Data Processing Services
Athens Medical Center SA	Greece	806: Hospitals
Bae Systems PLC	UK	372: Aircraft and Parts
Banco Santander SA	Spain	602: Commercial Banks
Bauer AG	Germany	353: Construction and Related Machinery
Biotest AG	Germany	283: Drugs
Bpost	Belgium	421: Trucking and Courier Services, Except Air
British American Tobacco PLC	UK	211: Cigarettes
Bt Group PLC	UK	489: Communications Services
Btg PLC	UK	738: Miscellaneous Business Services
Bunzl Public Limited Company	UK	267: Miscellaneous Converted Paper Products
Burckhardt Compression Holding AG	Switzerland	281: Industrial Inorganic Chemicals
Carclo PLC	UK	232: Men's and Boys' Furnishings
Centrica PLC	UK	492: Gas Production and Distribution
Clariant AG	Switzerland	281: Industrial Inorganic Chemicals
Cloetta AB	Sweden	206: Sugar and Confectionery Products
Comarch SA	Poland	737: Computer and Data Processing Services
Conzzeta AG	Switzerland	355: Special Industry Machinery
Daimler AG	Germany	371: Motor Vehicles and Equipment
Deutsche Post AG	Germany	431: Terminal Facilities Freight Transport
Diebold Nixdorf AG	Germany	737: Computer and Data Processing Services
Domino's Pizza Group PLC	UK	581: Eating and Drinking Places
Dormakaba Holding AG	Switzerland	342: Cutlery, Hand Tools, and Hardware
Dufry AG	Switzerland	599: Retail Stores
Edp - Energias De Portugal, SA	Portugal	491: Electric Services
Ems-Chemie Holding AG	Switzerland	282: Plastics Materials and Synthetics
Euronav NV	Belgium	461: Pipelines, Except Natural Gas
Faes Farma SA	Spain	283: Drugs
Famur SA	Poland	353: Construction and Related Machinery
Firstgroup PLC	UK	411: Local and Suburban Transportation
Fjord1 ASA	Norway	448: Water Transportation of Passengers
Getlink SE.	France	478: Misc. Transportation Services
Gft Technologies SE	Germany	737: Computer and Data Processing Services
Greggs PLC	UK	581: Eating and Drinking Places
Imi PLC	UK	359: Industrial Machinery
Imperial Brands PLC	UK	211: Cigarettes
Jungheinrich AG	Germany	478: Misc. Transportation Services
Kinepolis Group SA/NV	Belgium	783: Motion Picture Theaters
Kitron ASA	Norway	367: Electronic Components and Accessories
Ksb Se & Co. KGaA	Germany	356: General Industrial Machinery
Lafuma SA	France	232: Men's and Boys' Furnishings
Lectra SA	France	737: Computer and Data Processing Services
Leifheit AG	Germany	343: Plumbing and Heating, Except Electric
Leroy Seafood Group ASA	Norway	209: Miscellaneous Food and Kindred Products
Lubelski Wegiel Bogdanka SA	Poland	124: Coal Mining Services
M.P. Evans Group PLC	UK	139: Oil and Gas Field Services
Marshalls PLC	UK	327: Concrete, Gypsum, and Plaster Products
Mbb SE	Germany	679: Miscellaneous Investing
Mears Group PLC	UK	734: Services to Buildings
Mimecast Limited	UK	737: Computer and Data Processing Services
Morgan Sindall Group PLC	UK	152: Residential Building Construction
Mowi ASA	Norway	273: Books
Mylan NV	Netherlands	283: Drugs
Newag SA	Poland	344: Fabricated Structural Metal Products
Norma Group	Germany	762: Electrical Repair Shops

Open Finance SA	Poland	609: Functions Closely Related to Banking
Orange Polska SA	Poland	489: Communications Services
Orbis SA	Poland	701: Hotels and Motels
Ordina NV	Netherlands	489: Communications Services
Orior AG	Switzerland	201: Meat Products
Oxford Instruments PLC	UK	382: Measuring and Controlling Devices
Pcas	France	289: Miscellaneous Chemical Products
Per Aarsleff Holding A/S	Denmark	162: Heavy Construction, Except Highway
Petropavlovsk PLC	UK	104: Gold and Silver Ores
Pittards PLC	UK	311: Leather Tanning and Finishing
Polytec Holding AG	Austria	371: Motor Vehicles and Equipment
Prysmian SpA	Italy	366: Communications Equipment
Publicis Groupe SA	France	731: Advertising
Puma SE	Germany	394: Toys and Sporting Goods
Reach PLC	UK	271: Newspapers
Recipharm AB	Sweden	283: Drugs
Relx PLC	UK	274: Miscellaneous Publishing
Rheinmetall AG	Germany	371: Motor Vehicles and Equipment
Rio Tinto PLC	UK	109: Miscellaneous Metal Ores
Rotork PLC	UK	359: Industrial Machinery
Royal Dutch Shell PLC	UK	131: Crude Petroleum and Natural Gas
Sartorius AG	Germany	359: Industrial Machinery
Schibsted ASA	Norway	271: Newspapers
Schouw & Co A/S	Denmark	267: Miscellaneous Converted Paper Products
Scout24 AG	Germany	653: Real Estate Agents and Managers
Semcon AB	Sweden	737: Computer and Data Processing Services
Sensata Technologies Holding PLC	UK	382: Measuring and Controlling Devices
Serco Group PLC	UK	874: Management and Public Relations
Sioen Industries NV	Belgium	229: Miscellaneous Textile Goods
Societe Pour L'informatique Industrielle – Sii	France	737: Computer and Data Processing Services
Sonae.Com, Sgps, SA	Portugal	489: Communications Services
Stada Arzneimittel AG	Germany	283: Drugs
Stef	France	421: Trucking and Courier Services, Except Air
Superdry PLC	UK	513: Apparel, Piece Goods, and Notions
Sweco AB	Sweden	871: Engineering and Architectural Services
Takkt AG	Germany	596: Non-store Retailers
Talgo, SA	Spain	374: Railroad Equipment
Ted Baker PLC	UK	232: Men's and Boys' Furnishings
Tele Columbus AG	Germany	483: Radio and Television Broadcasting
Telefonaktiebolaget Lm Ericsson	Sweden	366: Communications Equipment
Telefonica SA	Spain	481: Telephone Communications
Terna SpA - Rete Elettrica Nazionale	Italy	491: Electric Services
Thrace Plastics Holding And Commercial SA	Greece	308: Misc. Plastic Products
Thyssenkrupp AG	Germany	331: Blast Furnace and Basic Steel Products
Tiso Blackstar Group SE	UK	737: Computer and Data Processing Services
Tokmanni Group Oyj	Finland	599: Retail Stores
Tonnellerie Francois Freres	France	244: Wood Containers
Ubisoft Entertainment SA	France	737: Computer and Data Processing Services
Ultra Electronics Holdings PLC	UK	367: Electronic Components and Accessories
Veidekke ASA	Norway	161: Highway and Street Construction
Viking Line ABP	Finland	448: Water Transportation of Passengers
Voest-Alpine AG	Austria	332: Iron and Steel Foundries
Volati AB	Sweden	609: Functions Closely Related to Banking
Whitbread PLC	UK	701: Hotels and Motels
Anheuser-Busch InBev SA/NV	Belgium	208: Beverages
Foncière Euris	France	653: Real Estate Agents and Managers
easyJet PLC	UK	451: Air Transportation, Scheduled
Sulzer AG	Switzerland	285: Paints and Allied Products

Notes: number of observations (N) is 126. The table provides the list of non-family firms involved including country en industry where the firm is active in. Source: database Orbis.

Appendix C. Variable Definitions

Variable	Description
	Measures of risk-taking
zscore	score derived from a credit-strength formula that gauges the likelihood of bankruptcy
zscore"	score derived from a credit-strength formula that gauges the likelihood of bankruptcy, better fit for non-manufacturing firms
DE	debt-to-equity ratio, calculated by dividing the liabilities of the firm by its shareholders equity to evaluate financial leverage
	Family involvement variables
family	dummy variable which equals one if the firm is a family firm
FS	total shareholding by the family of the firm
FS1	dummy variable which equals one if the family owns less than 50% of the shares of the firm
FS2	dummy variable which equals one if the family owns more than 50% of the shares of the firm
FB	dummy variable which equals one if family members participate in the board of the firm
FCEO	dummy variable which equals one if the CEO is a family member
	Moderating variables
boardsize	the size of the board; the number of current managers and directors in the board of the firm
growth	1-YR annualized growth rate of the net sales or revenues of the firm
ROE	return on equity, measure of financial performance of the firm calculated by dividing net income by shareholders' equity
ROA	return on assets, measure of financial performance of the firm indicating how well a firm is generating profits from assets
segments	The number of business segments in which the firm is active
investhor	The investment horizon of the firm, describing the total length of time an investor expects to hold security/portfolio
	Control variables
creditor	getting credit and legal rights index
shareholder	strength of minority investor protection index
financialsys	dummy variable which equals one is the firm is active in market-based system and zero if active in bank-based system
age	age of the firm, number of years since incorporation of the firm
lage	natural logarithm of the variable age
size	total number of employees of the firm
lsize	natural logarithm of the variable size
SIC3	three-digit Standard Industry Classification (SIC) code
SIC_group	dummy variable for the 7 different industry sectors based on the three-digit SIC codes of the firms

Notes: definition of the variables involved in this research. *Source:* Orbis, Eikon Thomson Reuters, BoardEx, The World Bank.

Appendix D. Institutional Environment

	Financial System (Bank/Market)	Frequency (number)	Creditor rights index (0-12)	Minority shareholder rights index (0-10)
Country				
Austria	Bank-based	5	4	8
Belgium	Market-based	16	4	7
Denmark	Bank-based	5	8	9
Finland	Bank-based	3	7	9
France	Market-based	32	4	10
Germany	Bank-based	39	6	7
Greece	Bank-based	5	3	8
Italy	Bank-based	12	2	8
Luxembourg	Bank-based	2	3	7
Netherlands	Market-based	13	2	8
Norway	Market-based	7	5	10
Poland	Bank-based	10	7	8
Portugal	Bank-based	5	2	8
Spain	Bank-based	15	5	9
Sweden	Market-based	10	6	8
Switzerland	Bank-based	18	6	7
United Kingdom (UK)	Market-based	39	7	8

Notes: the total number of observations (N) is 236. The table gives an overview of the scores per country on the creditor rights index and minority shareholder rights index. *Source:* The World Bank.

Appendix E. Industry Classifications

The Standard Industry Classification (SIC) is a system for classifying industries by a digit code. The system is established in the United States in 1937 and used by government agencies to classify industry areas. The SIC codes can be grouped into progressively broader industry classifications: industry group, major group, and division. The first three digits of the SIC code indicate the industry group and the first two digits indicate the major group. Each division encompasses a range of SIC codes. The following table shows the distribution of family and non-family firms in the broad SIC industry divisions.

NUMBER AND PERCENT OF FAMILY AND NON-FAMILY FIRMS BY SIC DIVISION

Sector	SIC Code	All firms Freq.	Family Freq.	%	Non-family Freq.	%
Mining	102 – 149	11	6	5	5	4
Construction	152 – 179	15	10	9	5	4
Manufacturing	201 – 399	111	49	45	62	49
Transportation, Communication, Electric & Gas	401 – 497	26	6	5	20	16
Wholesale & Retail Trade	501 – 599	23	16	15	7	6
Finance, Insurance & Real Estate	601 – 679	19	13	12	6	5
Services	701 – 874	31	10	9	21	17
Total		236	110	100	126	100

Notes: in this research the 3-digit Standard Industry Classification (SIC) is used to determine the industry of each firm. The total number of observations (N) is 236, consisting of 110 family firms and 126 non-family firms. The table gives a rough indication of the firms per main sector. There are *Source:* Eikon Thomson Reuters.

1 0 2

Major Group
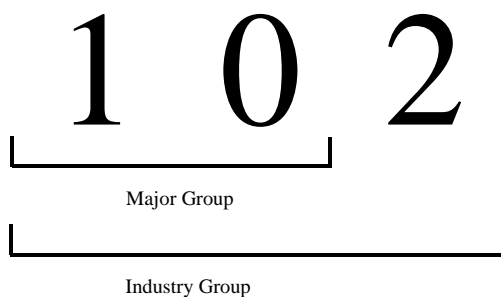
Industry Group

SIC CODE EXAMPLE

Notes: the figure shows an example of a three-digit SIC code. In this case, the SIC code is 102. This code represents the major group "Mining" and industry group "Copper Ores". *Source:* NAICS Association.

Appendix F. Correlation Matrix

Matrix of Correlations

Variables	DE	z-score	z-score"	family	growth	boardsize	ROA	ROE	segments	investhor	creditor	shareholder	ln(age)	ln(size)
DE	1.000													
z-score	-0.632	1.000												
z-score"	-0.662	0.725	1.000											
family	-0.095	0.158	0.155	1.000										
growth	-0.154	0.114	0.145	-0.008	1.000									
boardsize	0.120	-0.144	-0.124	-0.323	-0.051	1.000								
ROA	-0.347	0.606	0.430	0.031	0.109	0.004	1.000							
ROE	-0.008	0.323	0.068	-0.050	0.065	0.034	0.642	1.000						
segments	-0.008	0.051	0.079	0.114	-0.029	0.063	0.012	-0.036	1.000					
investhor	0.051	0.044	-0.030	-0.041	-0.075	0.062	0.090	0.077	0.002	1.000				
creditor	-0.150	0.135	0.114	-0.272	0.000	0.015	0.057	0.109	-0.063	0.085	1.000			
shareholder	0.079	-0.098	-0.114	0.010	0.033	-0.090	-0.022	-0.059	-0.019	0.016	-0.212	1.000		
ln(age)	-0.027	0.119	0.173	0.324	-0.090	-0.137	0.114	0.078	0.129	0.004	0.013	-0.016	1.000	
ln(size)	0.194	-0.110	-0.199	0.270	-0.220	0.202	-0.045	-0.001	0.175	0.123	-0.068	0.031	0.234	1.000

Notes: the correlation matrix contains all variables involved in this research. The total number of observations (N) is 236. Correlation coefficient of ±0.50 to ±1.00 indicates strong correlation, of ±0.30 to ± 0.50 indicates moderate correlation, and ±0.10 to ±0.30 indicates weak correlation between two variables. *Source*: Author calculations in Stata.

Appendix G. VIF Test

Variance Inflation Factor

Variable	VIF	1/VIF
ROA	2.042	0.490
ROE	2.017	0.496
family	1.629	0.614
ln(size)	1.413	0.708
boardsize	1.314	0.761
ln(age)	1.203	0.831
creditor	1.170	0.855
shareholder	1.074	0.931
growth	1.073	0.932
segments	1.070	0.935
investhor	1.054	0.949
Mean VIF	1.369	

Notes: Variance Inflation Factor (VIF) is used to check for (multi)collinearity. When the degree of multicollinearity increases, the regression model estimates of the coefficients in this research become unstable and standard errors can get widely inflated. As a rule of thumb, a variable whose VIF values are greater than 10 need further investigation. Tolerance, defined as 1/VIF, is also used by many researchers. A tolerance lower than 0.1 is comparable to a VIF of 10. Source: Author calculations in Stata.

Appendix H. Robustness Checks

To make sure the estimates of the regression coefficients are as precise as possible, it is important in Ordinary Least Squares regression to look at the assumption of homoskedasticity. OLS assumes that all residuals are drawn from a population that has a constant variance. To control for possible heteroskedasticity in the cross-sectional regression analysis, the White (1980) method is used to compete the heteroskedasticity consistent standard errors. Lee (2006) also conducted this method in their research on family firm performance. In the regression analyses robust standard errors have been taken into consideration. This ensures more accurate p-values.