SFB 649 Discussion Paper 2007-059

LONG-TERM ORIENTATION IN FAMILY AND NON-FAMILY FIRMS: A BAYESIAN ANALYSIS

Jörn Hendrich Block*
Andreas Thams**

* Technische Universität München, Germany
** Freie Universität Berlin, Germany

This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 "Economic Risk".

http://sfb649.wiwi.hu-berlin.de
ISSN 1860-5664

SFB 649, Humboldt-Universität zu Berlin
Spandauer Straße 1, D-10178 Berlin

LONG-TERM ORIENTATION IN FAMILY AND NON-FAMILY FIRMS: A BAYESIAN ANALYSIS*

JÖRN HENDRICH BLOCK
Technische Universität München
Dr. Theo Schöller Chair in Technology and Innovation Management
Arcisstr. 21, D-80333 München
Tel: 0049 89-28925746
Fax: 0049 89-28925742
e-mail: block@wi.tum.de

ANDREAS THAMS
Freie Universität Berlin
Institute of Statistics and Econometrics
Boltzmannstr. 20, D-14195 Berlin
Tel: 0049 30-83853399
Fax: 0049 30-83854172
e-mail: andreas.thams@wiwiss.fu-berlin.de

Keywords: Family Firm, Long-term Orientation, Myopia, Bayesian Analysis, Agency Theory, Stewardship Theory, Investment Policy

JEL Classifications: C11, D21, G31, G32, L20, M31, O32

* Comments from Oliver Alexy, Joachim Henkel, and Oliver Klöckner, seminar participants at European Business School (European Family Business Center), the 7th annual ifera conference, Technische Universität München and Ludwig-Maximilians-Universität München (TIME Kolloquium, Seminar für Empirische Wirtschaftsforschung, and Dr. Theo Schöller-Stiftungslehrstuhl für Technologie- und Innovationsmanagement) were much appreciated. We also thank Thomas Daffner, Andreas Riemann, Gaurav Rishi, Frank Spiegel, and Marc Weiglein for excellent research assistance. All remaining errors are our own. This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 "Economic Risk".

LONG-TERM ORIENTATION IN FAMILY AND NON-FAMILY FIRMS: A BAYESIAN ANALYSIS

ABSTRACT

A stronger long-term orientation is considered a competitive advantage of family firms relative to non-family firms. In this study, we use panel data of U.S. firms and analyze this proposition. Our findings are surprising. Only in when the family is involved in the management of the firm is the firm found to invest more in long-term projects relative to a non-family firm. We also find that investment in long-term projects in family firms is determined less by cash flow variations than for non-family firms. Managerial implications of our findings are discussed. Our hypotheses are tested using Bayesian methods.

Most firms around the world are family-owned (e.g., Becht & Roell, 1999; Faccio & Lang, 2002; La Porta, Lopez-de-Silanes, & Shleifer, 1999; Shleifer & Vishny, 1986), and a growing number of studies compares family and non-family firms in terms of financial performance (e.g., Andersen & Reeb, 2003; Barontini & Caprio, 2005; Villalonga & Amit, 2005). For large U.S. corporations, the evidence is mixed. For example, Holdernees and Sheenan (1988) find that family firms have a lower market-to-book value; Andersen and Reeb (2003) find the opposite to be true. A stronger long-term orientation is considered an explanation as to why family firms might perform better than non-family firms. For example, Andersen and Reeb (2003) note that "families potentially have longer horizons than other shareholders, suggesting a willingness to invest in long-term projects relative to shorter managerial horizons" (Andersen & Reeb, 2003: 1305) (for this argument, see also James, 1999; Miller & Le Breton-Miller, 2005; and Le Breton-Miller & Miller, 2006). In this paper, we aim to determine whether this argument is true and analyze whether family firms pursue a more long-term oriented strategy than non-family firms.

To address this question, we created a panel data set of large publicly-traded U.S. family and non-family firms for the years 1994-1999. We used data on R&D and capital expenditures as proxies for investment in long-term projects and analyzed the R&D and investment strategy of both types of firms using a Bayesian approach. Our findings were surprising. Only in the case of a member of the family as either CEO and/or chairman of the firm was the firm found to invest more in long-term projects compared to a non-family firm. We also found that investment in long-term projects in a family firm is determined less by cash flow variations compared to a non-family firm.

This study makes three contributions to management research. First, we contribute to the literature on the performance of family and non-family firms. Even though a stronger long-term orientation is widely regarded as an explanation of why family firms might outperform non-family firms (e.g., Andersen & Reeb, 2003; James, 1999; Miller & Le Breton-Miller, 2005; Le Breton-Miller & Miller, 2006), empirical evidence (at least from large-scale quantitative data) on this issue is sparse. Our study aims to close this gap. Second, we contribute to the literature on the causes of managerial myopia (e.g., Jacobs, 1991; Laverty, 1996; Porter, 1992). Some of the explanations for managerial myopia such as managerial opportunism (Narajan, 1985; Hirshleifer & Thakor, 1994) or fluid and impatient capital (Porter, 1992) are unlikely to apply to family firms. By analyzing long-term orientation in family firms, we examine the validity of these arguments. In this context, we also contribute to the literature on the relationship between ownership and R&D expenditures (e.g., Bushee, 1998; David, Hitt, & Gimeno, 2001; Hansen & Hill, 1991; Lee & O'Neill, 2003). Third, we use Bayesian regression analysis to test our hypotheses. So far, this method has rarely been used in management research (Hahn & Doh, 2006). In our analysis, we aim to demonstrate the usefulness of Bayesian methods in testing propositions of management theory.

The remainder of the article presents a theoretical rationale for the influence of family ownership and/or management on long-term orientation and an empirical examination of this relationship. Implications of our findings are discussed from the perspectives of non-family shareholders and other stakeholders in family firms.

THEORY AND HYPOTHESES

In this section, we first summarize the literature on short-term behavior and then discuss why family firms might have a more long-term horizon relative to non-family firms. We develop hypotheses about the differences in long-term orientation between family and non-family firms.

Intertemporal Choice and Managerial Myopia

In the late 1980s and early 1990s, there was a prominent debate about economic short-terminism in the U.S. (Laverty, 1996). The claim was that U.S. firms were either unwilling or unable to make necessary investments for the future, which require a dismissal of short-term profits. This myopic behavior was claimed to place U.S. firms at a competitive disadvantage against firms from Germany or Japan, which were said to operate in a less myopic institutional environment (Jacobs, 1991; Porter, 1992). Although we do not want to delve too deep into this debate, we list some of the main arguments, as they also apply to the basic idea of our study: a comparison of long-term orientation in family and non-family firms. To understand these arguments, we need to introduce the concept of intertemporal choice.

The idea of myopic behavior is strongly linked to the concept of intertemporal choice, a notion that is extensively studied in both economics and psychology (for a summary, see Loewenstein & Thaler, 1989). Generally, problems of intertemporal choice occur when costs and benefits of a particular decision are separated over time. Top-level management decisions, such as technology investments or entrance into a new market, often involve intertemporal choice. Echoing Laverty (1996), we define an intertemporal choice problem, as applied to management decisions, as a situation in which "the course of action that is best in the short term is not the same course of action that is best over the long run" (Laverty, 1996: 828). Generally, problems

of intertemporal choice involve a determination of the right balance between the long- and short-term. In a normative economic approach (e.g., Fisher, 1930; von Neumann & Morgenstern, 1953), this trade-off is solved by discounting future cash flows. This way, the problem is reduced to the discount rate that should be applied. Ceteris paribus—the use of a lower discount rate—leads to a more long-term behavior and vice versa.[1]

Laverty (1996) classifies the explanations for short-terminism into five categories: (1) flawed management practice, (2) managerial opportunism, (3) stock market myopia, (4) fluid and impatient capital, and (5) information asymmetry. The *flawed management practice* explanation refers to the overuse of formal investment evaluation techniques (e.g., the discounted cash flow technique) which neglect intangible and hard-to-quantify payoffs (Hayes & Abernathy, 1980). Advocates of the *managerial opportunism* explanation argue that short-term behavior might be an optimal choice from a manager's perspective. In moral hazard models, managers are shown to prefer to make short-term investments that pay off quickly to enhance personal reputation (Narayanan, 1985), or that managers are preoccupied with job safety and therefore favor short-term relative to long-term payoffs (Hirshleifer & Thakor, 1992). *Stock market myopia* may also be a reason for managerial myopia. The argument is that the stock market undervalues a long-term oriented investment behavior, and, accordingly, managers are forced to think in the short-term to avoid the risk of a takeover (Stein,1988). Johnson and Kaplan (1987) argue that investment professionals employed by financial investors focus too much on short-term figures in quarterly or annual reports. Similarly, Jacobs (1991) claims that when a stock is traded as a commodity, the owners of stock have less interest in waiting for long-term projects to pay off. This argument about the shortsightedness of capital markets is linked to the argument about *fluid and impatient*

[1] It should be noted that other reasons for differences in discount rates exist, e.g., psychological anomalies in decision-making under risk (see, e.g., Benzion, Rapoport, & Yagil, 1989; Kahnemann & Tversky, 1979).

capital. Porter (1992) argues that underinvestment might be the result of the short-term relationship between U.S. firms and the capital market. In contrast to Germany or Japan, where a large portion of equity is held by banks or (non-financial) firms, funds supplied in the U.S. often come from external capital providers (e.g., pension funds or other professional investment firms). Porter (1992) argues that these external capital providers move their funds more quickly than other investors and therefore understand less about the individual companies' long-run prospects. Finally, managerial myopia might also be explained by *information asymmetry*. In this explanation, managers know more about the firm than investors, and are forced to use strong short-term results as a signaling device for the quality of their management (Thakor, 1990). Interestingly, this argument holds regardless of managerial opportunism or stock market myopia.

Literature on the Relation between Ownership and Managerial Myopia

This subsection reviews the empirical literature on the relationship between managerial myopia and ownership structure. Most of the studies reviewed use R&D measures to analyze managerial myopia. This is not without problems. First, R&D data may also include many short-term projects (Laverty, 1993). Second, R&D does not always create economic value (Erickson & Jacobson, 1993; Hall, 1993). This latter aspect implies that R&D spending might, in fact, measure risk behavior rather than the willingness to invest in long-term projects. Despite these shortcomings, R&D is the most widely used proxy for measuring myopic behavior at the firm level.

A number of scholars analyzed the role of institutional investors in formulating the firm's R&D strategy. Their main finding was that, generally, institutional investors influence managers to invest more in R&D and thereby help to mitigate the managerial myopia problem (e.g., Baysinger, Kosnik, & Turk, 1991; Bushee, 1998; David et al., 2001; Hansen & Hill, 1991).

However, this effect is found to vary by the type of institutional investor[2] and shareholder activism[3]. Comparing the U.S. and Japan, Lee and O'Neill (2003) find that the level of ownership concentration has a positive impact on R&D spending for firms in the U.S., but not for firms in Japan. They conclude that agency theory represents U.S. firms adequately, whereas stewardship theory better explains the situation in Japanese firms. We do not know of any study that analyzes the impact of family ownership and/or family management on R&D expenditures.

Long-term Orientation: Why Might Family Firms Be Different?

In this sub-section, we discuss why family firms might be more long-term-oriented than non-family firms. We proceed in two steps: first, we regard the perspective of the family as being the main shareholder. Second, we discuss the relationship between management and owners in family versus non-family firms. We use arguments from agency and stewardship theory alike, and, whenever possible, relate our arguments to the explanations for short-terminism mentioned above, as well as to family business research.

Family versus non-family shareholders. For firms that have a family as their main shareholder, the explanations for short-terminism that involve stock market myopia (e.g., Jacobs, 1991; Johnson & Kaplan, 1987) or fluid and impatient capital (e.g., Porter, 1992) are of less relevance for two reasons. First, from the perspective of a family shareholder, the firm is not just an asset which might be sold easily, as the firm symbolizes the heritage and tradition of the family and is therefore part of the family identity.[4] Consequently, family shareholders intend to pass the firm over to the next family generation (e.g., Casson, 1999; Guzzo & Abbot, 1990; Tagiuri &

---

2 Bushee (1998) finds that institutional investors who have a high portfolio turnover and engage in short-term trading actually increase the probability of managers reducing R&D.

3 David, Hitt, and Gimeno (2001) find that institutional ownership alone is insufficient to have an effect. Activism on the part of these investors is required to make managers investing more in R&D.

4 See Pratt (1998) for the psychological concept of identification.

Davis, 1992). Second, the reputation of the family in the public is strongly linked to the well-being of the firm (Dyer & Whetten, 2006). This becomes even more evident as the firm often bears the family's name. For these two reasons, families as shareholders should be less likely than other types of shareholders to move their funds around quickly and be less likely to evaluate their investment only in terms of short-term results. The theory of psychological ownership might also help to explain differences between family and non-family shareholders. Pierce, Kostova, and Dirks (2001) define psychological ownership as "the feeling of possessiveness and of being psychologically tied to an object" (Pierce, Kostova, & Dirks, 2001: 299). A root of psychological ownership is in the control of the particular object that one owns. We argue that this applies more for family- than for non-family shareholders. In contrast to non-family shareholders, family-shareholders often have a close link to management (often by kinship ties). This close link allows them to explore and alter the firm and its environment. As a result, they have a greater feeling of being psychologically tied to the firm relative to non-family shareholders. This psychological connection should prevent them from moving their funds around quickly.

In the next two subsections, we discuss the relationship between management and shareholders in family versus non-family firms. We use arguments from both agency and stewardship theory.

Management in family and non-family firms: arguments from agency theory. Agency theory may be used to explain differences in investment behavior between family and non-family firms. These arguments from agency theory relate in a direct way to the managerial opportunism and information asymmetry explanation of short-term behavior. Agency theory is widely used to explain the relationship between management and owners of a firm (Fama, 1980; Jensen & Meckling, 1976; for a summary, see Eisenhardt, 1989). It describes managers as rational actors,

who seek to maximize their individual utility (Jensen & Meckling, 1976). Although this main assumption has its critics—even among agency theorists themselves (e.g., Jensen & Meckling, 1994)—this theory is a useful benchmark when explaining a relationship in which the respective parties' interests are at odds. From an agency theorist's perspective, the relationship between management and owners is fundamentally different in family and non-family firms. We argue that the incentive to invest in a long-term project is higher in a family firm relative to a non-family firm. Within the group of family firms, we differentiate between those family firms governed by family managers and those governed by professional non-family managers. Professional non-family managers are defined as persons who hold a management position in a family firm, but who are not related to the owning family by blood, marriage or adoption (v. Schulzendorff, 1984; Klein & Bell, 2007). Considering this distinction, we compare three different types of firms: (1) family-owned firms governed by family managers; (2) family-owned firms governed by professional non-family managers; and (3) non-family firms.

In the first case, the argument is simple: in a family-owned firm governed by family managers, managerial opportunism should be less of a problem, because no (or only minor) agency conflicts exist[5]; the utility functions of shareholders and management coincide to a large degree. This argument is even stronger given the fact that most family managers own a substantial share of the company they manage. In this case, they resemble owner-managers where no agency conflicts exist between owners and management (Jensen & Meckling, 1976). Another argument against the risk of managerial opportunism is that family managers have rather safe jobs compared to managers in non-family firms (e.g., Le Breton-Miller & Miller, 2006; Ward, 2004). They do not need to increase their reputation via strong short-term results. The information

[5] Schulze, Lubatkin, Dino, and Buchholtz (2001) argue the opposite: family firms are exposed to a self-control problem. Thus, they have a strong incentive to invest resources to curb this kind of opportunism.

asymmetry explanation of short-terminism is also less likely to apply. Family shareholders have often known the business and its (family) managers for a long time. They have a profound understanding of the business. Signaling via strong short-term results is therefore less attractive for the non-family manager.

For a family-owned firm governed by professional non-family managers, the argument is less straightforward. Contrary to family managers, professional non-family managers in family-owned firms have an incentive to engage in managerial opportunism. Their utility function does not always coincide with the utility function of the family owners. They are also less likely to have a significant ownership share in the company. Still, two arguments support the view that firms with family shareholders governed by professional non-family managers are more long-term oriented than "pure" non-family firms: first, incentives for monitoring are higher, because the owning families are strongly linked to their firm by feelings of identity and its reputation outside the organization. In addition, as their fractions of ownerships are typically higher, (economic) benefits from monitoring are also higher; a free-rider problem associated with firms that have only dispersed shareholders is unlikely (Fama, 1980; Maug, 1998). As a result, managers have less latitude to engage in managerial opportunism. Second, information asymmetry between owners and management is less of a problem. There is less need to use strong short-term results as a signaling device because the owning family knows the business and has a good, long-term understanding of the business.

A non-family firm fits the situation described in the model of Jensen and Meckling (1976). Managers of a non-family firm have a strong incentive to engage in short-term behaviors that produce strong short-term results. This way, they secure their job within the firm and increase their value on the market for professional executives (Narayanan, 1985). Also, the infor-

mation asymmetry explanation seems relevant. As shareholders of a non-family firm are not linked to the firm by tradition or heritage, they are likely to move their funds around more quickly than shareholders who are linked to their firm by family ties. As a consequence, they should have less understanding of the underlying business model and are more likely to pay attention to short-term results. That is why managers in a non-family firm should be more likely to use strong short-term results as signaling devices for their management quality than managers in a family firm.

Management in family and non-family firms: arguments from stewardship theory. Stewardship theory is rooted in psychology and sociology and describes situations where executives that act as stewards are motivated to behave in the best interests of a company's owners (Davis, Schoorman, & Donaldson, 1997; Donaldson & Davis, 1991). Stewardship theory is useful when describing the relationship between management and owners in a family firm (e.g., Eddleston & Kellermanns, 2007). The model of man that underlies stewardship theory is fundamentally different from the model of man that underlies agency theory. The behavior of individuals in stewardship theory is ordered in a way that grants pro-organizational, collectivist behavior a higher utility than individualistic, self-serving behavior (Davis et al., 1997). Consequently, the managerial opportunism explanation for short-term behavior becomes meaningless. Davis and coauthors (1997) propose factors that lead individuals to act as pro-organizational, collectivist stewards rather than as individualistic, self-serving agents. They differentiate between psychological and situational factors. We argue that some of these factors are more likely to be found in family firms relative to non-family firms.

Davis and coauthors (1997) argue that people who are high in identification with the organization or high in value commitment are more likely to act as stewards rather than as agents.

For family managers, the argument is simple. As the firm is part of the family identity, family managers strongly identify with the firm. In addition, family managers are also likely to believe in and accept the firms' goals, which are shaped to a large degree by the owning families. Consequently, value commitment should be higher. For the case of professional non-family managers working in a family-owned firm, the main argument is about selection. When employing professional non-family managers, the owning family is likely to select these managers according to the two criteria: "identification" and "value commitment" (Chrisman, Chua, & Sharma, 1998).

Regarding situational factors, Davis and coauthors (1997) propose that people who are in an involvement-oriented rather than in a control-oriented situation are more likely to behave as stewards. This proposition refers to Lawler (1986) and his differentiation between control-oriented and involvement-oriented management philosophies. In a control-oriented approach, the thinking and controlling part of work is separated from the doing; in an involvement-oriented approach, self-control and self-management are emphasized. In family-owned firms that are governed by family managers, the management philosophy is involvement-oriented. Two reasons exist: first, shareholders and managers are members of the same family and are likely to trust one another, which reduces the need for control. Second, a sophisticated monitoring system would be of minor use. Only few possible sanctions exist, as it is hard to punish a member of your own family. With family-owned firms governed by professional non-family managers, the argument is again about selection. The owning family will carefully select the non-family managers that run their business, and, by the point they have taken a decision, will trust them. On the other hand, as the reputation of the family depends on the development of the firm, there is a strong need for control. Considering this, it remains unclear whether an involvement-oriented or

control-oriented management philosophy applies in family-owned firms governed by professional non-family managers.

Hypotheses

To test our proposition that family firms might pursue a more long-term oriented business strategy, we focus on two different particular aspects of long-term orientation. The first aspect concerns the problem of under-investment in a direct way. It is about the size of R&D and capital expenditures. Both R&D and capital expenditures involve an intertemporal choice problem. In both cases, payoffs are unlikely to occur in the immediate future.[6] Ceteris paribus, more long-term oriented firms should use lower discount rates when evaluating investment decisions and therefore have higher R&D and capital expenditures than other firms. Based on our arguments in the preceding subsections on the differences between family and non-family firms, the following two hypotheses should hold:

Hypothesis 1. R&D expenditures are higher in family than in non-family firms.

Hypothesis 2. Capital expenditures are higher in family than in non-family firms.

Most of the empirical literature concerns this particular aspect of long-term orientation. Reflecting some of the criticism of using the size of R&D spending as a measure for long-term behavior (e.g., Laverty, 1993), we also compare the determinants of R&D and capital expenditures in family firms to those in non-family firms. This aspect is much less analyzed in the literature. In par-

[6] The only difference is that payoffs from R&D expenditures are likely to be more risky than payoffs from capital expenditures.

ticular, we are interested in the role of cash flow on the firms' R&D and investment strategies.[7] We hypothesize that the impact of cash flow on the size of R&D or capital expenditures is lower for more long-term oriented firms[8]. The idea behind this hypothesis is that more long-term oriented firms adjust their business strategy to fluctuations in cash flow to a lower degree. With regard to family and non-family firms, the following two hypotheses should hold:

> *Hypothesis 3. The impact of cash flow on R&D expenditures is lower in family than in non-family firms.*

> *Hypothesis 4. The impact of cash flow on capital expenditures is lower in family than in non-family firms.*

In our arguments about differences between family and non-family firms, we differentiate between family firms led by family managers and family firms led by professional non-family managers. We do not formulate a hypothesis about this subject, because predictions from theory are not clear.

DATA AND METHOD

In this section, we describe the construction of our estimation sample, the measures we use to test our hypotheses, and the Bayesian regression technique applied.

Sample Construction and Definition of a Family Firm

For our study, we use the Standard & Poors 500 (as of July 31, 2003) as a starting point to construct our sample. This particular date is chosen since an issue of BusinessWeek indicates the

---

7 The impact of financial constraints on R&D and investment is analyzed, to some extent, in the finance and economics literature. For a summary, see Hall (2005).

8 For a similar argument, see Hall, Mairesse, Branstetter, and Crepon (1999), who found that cash flow impacts on R&D and investment expenditures are much larger in the U.S. than in France or Japan.

family firms in the S&P 500 at this date (BusinessWeek, 2003). This publication is helpful as it gives qualitative information about the ownership structure and the management composition of the 177 family firms covered. As we want to analyze the determinants of R&D expenditures, we exclude firms which do not belong to one of the following six industries: chemical and allied products (SIC 28), industrial machinery and equipment (SIC 35), electronic and other electrical equipment (SIC 36), transportation equipment (SIC 37), instruments and related products (SIC 38), and business services (SIC 73).[9] To construct a panel data set, we then manually collected data about the companies' ownership structures and management compositions from corporate proxy statements submitted to the U.S. Securities and Exchange Commission in the years 1994-2003.[10] Furthermore, we checked and expanded our data with information from Hoover's Handbook of American Business, Gale Business Resources, the twentieth century American Business Leaders Database at Harvard Business School, Forbes Lists of 400 Richest Americans, Marquis Who's Who in America, and information available on the companies' websites. To get the final estimation sample, two further steps of data-cleaning were made: first, we restricted our sample to the years 1994-1999[11] because we do not want to confound our findings with the 2000-2002 stock market crash, which affected technology firms particularly hard. Second, we excluded observations with negative cash flow in the year before R&D and capital expenditures are measured.[12] Our final estimation sample covers 639 observations from 153 firms.

The definition of a family firm is a complex issue and involves very different aspects, ranging from management composition, ownership structure, and company age to corporate culture. Klein, Astrachan, and Smyrnios (2000) propose and test the application of a scale that as-

---

9 347 firms were excluded.

10 Mostly, this information was found in the definitive proxy statement (DEF 14A). The Securities Exchange Act of 1934 requires officers, directors, and five percent owners to disclose their holdings.

11 628 observations were excluded.

12 25 observations were excluded.

sesses the extent and quality of family influence via the three dimensions "power", "experience", and "culture." In our study, we focus on the "power" dimension and classify a firm as a family firm when either the founding family owns more than 5% of voting stock or a member of the founding family is either CEO or chairman of the company (this is a broad definition). To test the robustness of our results, we also used a narrower definition, in which a firm is classified as a family firm when the founding family owns at least 5% of voting stock and a member of the founding family is either CEO or chairman of the company.[13] Individuals are members of the founding family if they are either the founder themselves, or if they are related to the founder by kinship. Information about kinship is from Hoover's Handbook of American Business, Gale Business Resources, Marquis Who's Who in America, and the companies themselves. Our means of classifying family and non-family firms is comparable to Anderson and Reeb (2003) or Villalonga and Amit (2006). Not surprisingly, the resulting classification is also very much comparable. With the broad definition of a family firm, about 40% of the observations in our sample belong to family firms (255 observations); with the narrow definition of a family firm, this share reduces to 10.95% (70 observations). Table 1 summarizes our final estimation sample by industry affiliation and type of firm (i.e., family or non-family).

Insert Table 1 about here

Measures

The following measures are used as the study's variables. Except for the variables *family firm* and *company age*, all other data is from COMPUSTAT. The two dependent variables *R&D* or *capital expenditures* are measured as the ratio of R&D expenditures to assets or capital expendi-

[13] By comparing the robustness of the results of our analysis with regard to the definition of a family firm, we may learn something about the effect of the family being a member of the firm's management.

tures to assets. *Cash flow* is calculated as the ratio of cash flow to assets. As we intend to measure the firm's internally generated funds before payment of dividends, it is constructed as the sum of after-tax income, depreciation, and after-tax R&D (R&D expenditures regression) or after-tax income, depreciation and capital expenditures (capital expenditures regression) (Hall, 1992; Grabowski & Vernon, 2000). *Market-to-book ratio* is calculated as the market value of equity at the end of the year plus the book value of debt divided by the book value of total assets. *Firm size* is measured as the book value of total assets. *Leverage* is determined by dividing the book value of debt with the book value of total assets. Two-digit SIC codes are used to construct indicator variables for the six industries in our sample. As the distributions of the variables *firm size* and *company age* are skewed, logarithmic values are taken. Except for the variable *company age* as well as *industry* and *time dummies*, all other covariates are lagged by one year. This way, we avoid problems of endogeneity. Table 2 describes the variables in more detail.

Insert Table 2 about here

Bayesian Regression

Our hypotheses are tested using Bayesian methods. Bayesian methods rely on Bayes' theorem of probability theory (Bayes, 1763). This theorem is given by

$$\Pr(\theta \mid y) = \frac{\Pr(y \mid \theta)\Pr(\theta)}{\Pr(y)}, \tag{1}$$

where θ represents the set of unknown parameters, and y represents the data. $\Pr(\theta)$ is the prior distribution of the parameter θ, that may be derived from theory, expert opinion, or other external resources. $\Pr(y \mid \theta)$ is the likelihood function, which is the probability of the data y given the unknown parameter θ. $\Pr(y)$ is the marginal distribution of the data y, and finally,

$\Pr(\theta \mid y)$ represents the posterior distribution, which is the probability of the parameter θ given the data y. Equation (1) may also be written as

$$\Pr(\theta \mid y) \propto \Pr(y \mid \theta) \Pr(\theta), \tag{2}$$

where $\propto$ means "proportional to". In words: "the posterior distribution is proportional to the likelihood function times the prior distribution." In Bayesian analysis, interpretation comes from the posterior distribution, which states whether a particular parameter value is likely. This way, Bayesian methods are useful for testing theory. When testing a hypothesized relationship between two variables, Bayesian analysis proceeds in the following steps: first, a priori beliefs (from theory or other external resources) about the relationship of interest are formulated (the prior distribution, $\Pr(\theta)$). Next, a probability of occurrence of the data given these a priori beliefs is assumed (the likelihood function, $\Pr(y \mid \theta)$). In a second step, data is used to update these beliefs. The result is the posterior distribution, $\Pr(\theta \mid y)$. This posterior distribution gives a probability density function of the relationship between these two variables. That is, it allows for statements in terms of likely and unlikely parameter values. This highlights the fundamental difference between classical and Bayesian econometrics. Bayesian econometrics does not assume that there are true and fixed coefficients. Instead, parameters are regarded as being stochastic.

In recent years, Bayesian methods have become increasingly prevalent in econometric analysis.[14] First applied in macroeconomics and decision theory, Bayesian methods have found their way to other social sciences, particularly with applications in marketing research.[15] Few Bayesian studies, however, exist in strategy research. A rare example is Hansen, Perry, and

[14] See The Economist (2000) for a general discussion of Bayesian methods.
[15] Rossi and Allenby (2003) discuss the potentials of Bayesian statistics in marketing science.

Reese (2004) who use a Bayesian approach to operationalize the resource-based view.[16] We use a Bayesian approach to test our hypotheses for the following two reasons: first, Bayesian methods offer interpretations which are more intuitive and consistent with management theory. Contrary to classical methods, which assume that there are some "true" and non-stochastic coefficients, Bayesian methods give a region that contains the corresponding coefficient with a certain probability. This is useful because models in management research are usually not as omnipotent as their counterparts in the natural sciences. A specific theory may not be a valid mechanism to describe 100% of the observations; Bayesian analysis states the probability that the particular theory describes the data. Second, Bayesian methods have strong small sample properties and are relatively robust to problems of multicollinearity (Hahn & Doh, 2006; Leamer, 1973). The reasons are that Bayesian methods do not rely on asymptotic theory[17] and allow us to express our prior knowledge about the coefficients in the prior distribution. Thus, if the sample is small and beforehand we know very little about the data-generating process behind it, we may express this uncertainty via a prior distribution with a large variance. The result of the Bayesian estimation, the posterior distribution, then says which parameter values are more likely. These advantages are not without a cost, however. The results of a Bayesian analysis relies on "subjective" a priori beliefs expressed in the prior distribution and the shape of the likelihood function (Rossi & Allenby, 2003). Therefore, it should be made clear where these beliefs come from and how they influence the results. The usual way is to estimate several models with different assumptions about prior distributions and a likelihood function and to compare the results.

We describe the more technical details of our Bayesian analysis in the appendix. For the Matlab code used to perform our regressions, please contact the correspondence author.

---

16 Hahn and Doh (2006) discuss in general the potential for Bayesian methods in strategy research.

17 Asymptotic theory requires a particular sample size and assumes low levels of correlation between the independent variables included in the regression model.

RESULTS

Descriptive Statistics

In this subsection, we compare family and non-family firms using descriptive statistics. For this comparison, the broad definition of a family firm is applied. Table 1, above, shows family and non-family firm-year observations by industry association. The overall share of family firm-year observations is 39.91%. However, this share varies much by industry, e.g., 61.45% in the business services sector versus only 24.24% in the transportation equipment sector. R&D and capital expenditures also differ very much by industry; e.g., the median ratio of R&D expenditures to assets is 10.58% in the businesses services sector versus only 4.01% in the industrial machinery and equipment sector. Table 3 compares family and non-family firms with respect to financial performance, R&D and capital expenditures, and the covariates in the regression models. It presents means, medians, and interquartile ranges of the variables for the two groups. Most distributions are highly skewed, which is why we use median values and a Wilcoxon rank-sum test to compare family and non-family firms. A firm is classified as a family firm if it has more family than non-family observations and vice versa; our sample consists of 66 family and 87 non-family firms. Family and non-family firms differ to a large degree in their characteristics. Family firms have a higher pretax return on assets; the median for family firms is 14.77% versus 10.61% for non-family firms ($p < 1\%$). Yet, there is no significant difference with regard to pretax return on equity, which might be explained by the lower level of debt in family firms. Regarding R&D expenditures, univariate statistics show family firms to have a higher ratio of R&D expenditures-to assets (median of 8.93% versus median of 5.41% with $p < 1\%$). However, this preliminary result should be interpreted with great caution because the share of family firms is particularly high in industries with high levels of R&D spending (e.g., business services or electronic and

other electrical equipment, Table 1). Concerning capital expenditures, there seem to be no differences between family and non-family firms. With regard to the independent variables, the following differences stand out: relative to non-family firms, family firms are on average younger, smaller, and associated with a lower level of debt. Further, they are valued higher by the stock market, measured as market-to-book ratio (median of 3.42 versus median of 1.71 with $p < 1\%$). The ratio of cash flow-to assets is also higher in family than in non-family firms (median of 18.55% versus median of 13.87% with $p < 1\%$). To summarize, the univariate statistics show that family and non-family firms differ strongly, which reveals the necessity to control for these differences in the multivariate analysis as well as by using panel data, which enables controlling for unobserved heterogeneity by using a fixed-effects specification. Table 4 shows some more characteristics of the family firms in our estimation sample.

Insert Tables 3 and 4 about here

Regression Results

Table 5 and 6 show the results of our Bayesian regression analyses on *R&D expenditures to assets* and *capital expenditures to assets*, respectively.

Insert Tables 5 and 6 about here

Hypotheses 1-2. Hypothesis 1 states that the size of R&D expenditures is positively related to a firm being a family firm; hypothesis 2 asserts that capital expenditures are higher in family than in non-family firms. To test these two hypotheses, we estimated two regressions with the ratio of *R&D expenditures to asset*s or *capital expenditures to asset*s as dependent variables and the independent variables as shown in Tables 5 and 6, respectively. As outlined above, the

result of a Bayesian regression is a distribution function of each parameter in the regression model. We report the median values of these distributions as well as the probability that the parameter is positive. Overall, we find mixed evidence that hypothesis 1 or hypothesis 2 is true. When using the broad definition of a family firm, neither hypothesis 1 nor hypothesis 2 is supported. Controlling for the particularities of family firms such as a younger age, a lower level of debt, and a smaller firm size, the coefficient of the variable family firm is more likely to be negative than positive. The median coefficient of the variable "*family firm*" in the R&D expenditures to assets regression is -0.0178; the probability of a positive effect is 6.61% (Table 5). The median coefficient in the capital expenditures to assets regression is -0.0103; the probability of a positive effect is 6.78% (Table 6). This result changes, however, when the more narrow definition of a family firm is applied. With this more narrow definition, the probability of a positive effect is 90.68% (R&D expenditures regression) or 64.50% (Capital expenditures regression). Possible explanations for the mixed support of our hypotheses are presented in the discussion section. Figure 1 displays the entire distribution functions of the variable *family firm* (broad definition) graphically.

Insert Figure 1 about here

Hypotheses 3-4. Hypothesis 3 states that the impact of cash flow on R&D expenditures is lower in family relative to non-family firms; hypothesis 4 states that the impact of cash flow on capital expenditures is lower in family versus non-family firms. To test these two hypotheses, we included an interaction term "*family firm X cash flow*" in the regression models (see Tables 5 and 6). A negative sign of the coefficient that belongs to this interaction term is interpreted as positive evidence for our hypotheses. To ensure that this effect is not due to younger age, smaller

size, or lower level of debt of family firms relative to non-family firms, we also included a number of other interaction terms. Overall, we find strong evidence that both R&D and capital expenditures are determined to a lower degree by variations of cash flow in family firms relative to non-family firms. The median coefficients of these interaction terms are -0.0407 (R&D expenditures regression) or -0.0622 (capital expenditures regression); the corresponding probabilities of a positive effect are 18.29% or 1.43%. Figure 2 shows the entire distribution functions. The use of the more narrow definition of a *family firm* does not change the results (see Tables 5 and 6). Figure 2 displays the entire distribution functions of the variable *family firm* (broad definition) graphically.

Insert Figure 2 about here

Limitations

Our data suffers from some limitations that might limit generalizations stemming from our results with regard to the universe of all family firms. First, we cover only large publicly listed U.S. firms in the years 1994-1999. Our findings do not necessarily apply to small or not publicly listed family firms. Second, most of the family firms in our sample are rather young; in 43% of all family firms, the founder is still the CEO (Table 3). The mechanisms might be different in multi-generation family firms. It should be noted, however, that our data is very much comparable to Andersen and Reeb (2003) as well as Villalonga and Amit (2006), two highly cited studies in the field of family business research.

DISCUSSION AND CONCLUSION

Little quantitative research exists on why family firms might show a different performance than non-family firms. From a theory perspective, a stronger long-term orientation is considered a

competitive advantage of family firms relative to non-family firms (e.g., Andersen & Reeb, 2003; James, 1999; Miller & Le Breton-Miller, 2005; Le Breton-Miller & Miller, 2006). In our study, we analyze this proposition in detail. We use panel data from large U.S. technology firms to study the R&D and investment behavior of family firms relative to non-family firms. The results are mixed, however.

Evaluation of Results

Hypothesis 1-2. When using the broad definition of a family firm, both hypothesis 1 and hypothesis 2 are not supported. We find no evidence that family firms have higher R&D or capital expenditures than non-family firms. When using the narrow definition of a family firm, this result changes in that we find strong support for hypothesis 1 and weak support for hypothesis 2. It seems that the posited theory is not true for all types of family firms; being a family firm is not always positively associated with long-term orientation. For example, our findings suggest that long-term orientation is much stronger when the family firm is managed by a family member. This finding can be explained as follows: when the owning family leaves the management of the firm, the family regards its stake in the firm more like a financial investment, rather than as a part of the family identity. Like other financial investors, the family then wants to see strong (short-term) results. Another explanation would be managerial opportunism on the side of the professional non-family manager; the professional non-family manager wants to use strong short-term results as a signaling device for his or her management quality. Another argument supporting the managerial opportunism argument is that family firms are also fertile for conflicts, such as sibling rivalries or conflicts between two family generations (e.g., Harvey & Evans, 1994; Eddleston & Kellermanns, 2007). The management of these conflicts might distract the family owners from effectively monitoring the non-family manager. Generally, our results are in line with Kets

de Vries (1993), who compares professional non-family with family CEOs and finds the latter are " not haunted by quarterly results" […] and "are more wiling to plow profits back into the business" (Kets de Vries, 1993: 62).

Hypothesis 3-4. Both hypothesis 3 and hypothesis 4 are strongly supported by our data. We find strong evidence that the size of R&D and capital expenditures is less determined by variations of cash flow in family firms relative to non-family firms. Our interpretation is that family firms are more able or more willing to withstand pressures to cut R&D or capital expenditures when cash flow is tight. A family firm seems to adjust to a lower degree its business strategy to its cash flow situation. This behavior might be explained by a different set of priorities of family firms relative to non-family firms (e.g., Casson, 1999; Tagiuri & Davis, 1992). The long-term existence of the firm and its products seems to matter more than strong short-term results published in annual or quarterly financial reports.

Management theory. For management theory, our results have some important implications: first, although theory offers many explanations why family firms might follow a more long-term oriented strategy, our empirical findings are mixed. It seems that family firms do not follow per se a more long-term oriented strategy. Our results suggest that, in fact, some family firms invest less on long-term projects. It seems that the degree of long-term orientation depends on the family being present in the management of the firm. Moreover, it seems that family firms to a lower degree adapt their strategy to their financial situation, which might be interpreted as a particular aspect of long-term orientation. A broader discussion on what actually constitutes a long-term oriented business strategy, how such a strategy is related to family firm characteristics, and how it can be measured seems fruitful. Another important result from the perspective of management theory is that we find evidence for the validity of the managerial opportunism (Na-

rajan, 1985; Hirshleifer & Thakor, 1992) explanation for managerial myopia. Long-term orientation was particularly strong when the interests of ownership and management were aligned. Correspondingly, our findings do not support the fluid and impatient capital explanation (Porter, 1992) for managerial myopia. Family-owned firms are not always found to invest more in long-term projects.

Practical Implications

The results of our study (in particular our findings with regard to hypothesis 3 and 4) have some practical implications for non-family shareholders and other stakeholders in family firms.

Non-family shareholders. Our results show that the R&D or investment strategies in family firms are determined to a lower degree by variations in cash flow than is the case in non-family firms. For non-family shareholders in family firms, this has two main implications: first, managerial behavior is more easily predictable; the management of a family firm is unlikely to change the R&D or investment strategy when the company is in financial distress. Second, short-term-oriented investors will find it hard to convince the management of a family firm to pay out dividends which would lead to a reduction of the firm's R&D or investment budget.

Other stakeholders. By other stakeholders, we mean employees, important suppliers, large customers or the local community. They are affected by the firm's strategic choices, but are not owners of the firm in a legal sense. Our result that family firms adapt their R&D and investment strategy to a relatively low degree to variations in cash flow is important news to them. Members of these groups are less likely to lose their relationship-specific investments undertaken. For example, in times of financial distress, employees in R&D departments should be less afraid to lose their job; similarly, suppliers who have a R&D cooperation with the firm should be less concerned about the future of their cooperation. Hence, for stakeholders, it is a relatively

low-risk strategy to invest in a relationship with a family firm. This is particularly relevant for stakeholders who have the discretion to invest in both family and non-family firms (e.g., important suppliers, the local community, and cooperating universities).

Future Research

Our study suggests at least three opportunities for future research. One avenue would be to look more closely at the different types of family firms that exist. Our dataset is confined to large publicly-listed U.S. firms, which is not representative of all firms. Questions worth analyzing are: Is there a difference in long-term orientation between private and publicly listed family firms? How long-term-oriented is a family firm when there is a conflict within the owning family? Another avenue of research might focus on other aspects of long-term orientation such as investment in long-term relationships with employees, clients or the local community (Le Breton-Miller & Miller, 2006). Lastly, a third avenue would be to relate differences in long-term orientation between family and non-family firms to differences in financial performance.

REFERENCES

Anderson, R. C., & Reeb, D. R. 2003. Founding family ownership and firm performance: evidence from the S&P 500. ***The Journal of Finance***, 57: 1301-1328.

Barontini, R., & Caprio, L. 2005. The effect of family control on firm value and performance: evidence from continental Europe. ***European Financial Management***, 12: 689-723.

Bayes, T. 1763. An essay towards solving a problem in the doctrine of chances. ***Philosophical ransaction of the Royal Society of London,*** 53: 370-418.

Baysinger, B. D., Kosnik, R. D., & Turk, T. A. 1991. Effects of board and ownership structure on corporate R&D strategy. ***Academy of Management Journal***, 34: 205-214.

Becht, M., & Roell, A. 1999. Blockholdings in Europe: an international comparison. ***European Economic Review***, 43: 1049-1056.

Benzion, U., Rapoport, A., & Yagil, J. 1989. Discount rates inferred from decisions: An experimental study. ***Management Science***, 35: 270-284.

Bushee, B. J. 1998. The influence of institutional investors on myopic R&D investment behaviour. ***The Accounting Review***, 78: 305-333.

BusinessWeek. 2003. Family Inc. November 10: 111-114.

Casson, M. 1999. The economics of the family firm. ***Scandinavian Economic History Review***, 47: 10-23.

Chrisman, J. J., Chua, J. H., & Sharma, P. 1998. Important attributes of successors in family businesses: an exploratory study, ***Family Business Review***, 11: 19-34.

David, P., Hitt, M., & Gimeno, J. 2001. The influence of activism by institutional investors on R&D. ***Academy of Management Journal***, 44: 144-157.

Davis, J. H., Schoorman, F. D., & Donaldson, L. 1997. Toward a stewardship theory of management. ***Academy of Management Review***, 22: 20-47.

Donaldson, L., & Davis, J. H. 1991. Stewardship theory or agency theory: CEO governance and shareholder returns. ***Australian Journal of Management***, 16: 49-64.

Dyer, W. G., & Whetten, D. A. 2006. Family firms and social responsibility: preliminary evidence from the S&P 500. ***Entrepreneurship Theory and Practice***, 30: 785-802.

Eddleston, K. A., & Kellermanns, F. W. 2007. Destructive and productive family relationships: A stewardship theory perspective. ***Journal of Business Venturing***, 22: 545-565.

Eisenhardt, K. 1989. Agency theory: An assessment and review. ***Academy of Management Review***, 14: 57-74.

Erickson, G., & Jacobson, R. 1992. Gaining competitive advantage through the discretionary expenditures: the return to R&D and advertising. ***Management Science***, 38: 1264-1279.

Faccio, M., & Lang, L. H. P. 2002. The ultimate ownership of Western European corporations. ***Journal of Financial Economics***, 65: 365-395.

Fama, E. F. 1980. Agency problems and the theory of the firm. ***Journal of Political Economy***, 88: 288-307.

Fisher, I. 1930. ***The theory of interest.*** New York: Macmillan.

Grabowski, H., & Vernon, J. 2000. The determinants of pharmaceutical research and development expenditures. ***Journal of Evolutionary Economics***, 10: 201-215.

Guzzo, R., & Abbott, S. 1990. Family firms as utopian organizations. ***Family Business Review***, 3: 23-33.

Hahn, J., & Doh, J. P. 2006. Using bayesian methods in strategy research: an extension of Hansen et al.. ***Strategic Management Journal***, 27: 783-798.

Hall, B. H. 1992. ***Investment and research and development at the firm level: does the source of financing matter***. Working paper no. 4096, NBER, Cambridge, Mass..

Hall, B. H. 1993. The stock market's valuation of R&D investment during the 1980's. ***American Economic Review***, 83: 259-264.

Hall, B. H., Mairesse, J., Branstetter, L., & Crepon, B. 1999. Does cash flow cause investment and R&D: An exploration using panel data for French, Japanese, and United States firms in the scientific sector. In D. Audretsch, D. & A. R. Thurik (eds.), ***Innovation, Industry, Evolution and Employment***. Cambridge, UK: Cambridge University Press.

Hall, B. H., 2005, The financing of innovation. In S. Shane (ed.), ***Blackwell Handbook of Technology and Innovation Managemen***t. Oxford: Blackwell Publishers.

Hansen, G. S., & Hill, C. W. L. 1991. Are institutional investors myopic? A time-series study of four technology-driven industries. ***Strategic Management Journal***, 12: 1-16.

Hansen, M., Perry, L. T., & Reese, C. S. 2004. A bayesian operationalization of the resource-based view. ***Strategic Management Journal***, 25: 1279-1295.

Harvey, M., & Evans, R. E., 1994. Family business and multiple levels of conflict. ***Family Business Review***, 7: 331-348.

Hayes, R. H., & Abernathy, W. J. 1980. Managing our way to economic decline. ***Harvard Business Review***, 58: 67-77.

Hirshleifer, D., & Thakor, A. V. 1992. Managerial reputation, project choice and debt. ***Review of Financial Studies***, 5: 437-470.

Holderness, C. G., & Sheenan, D. P. 1988. The role of majority shareholders in publicly held corporations. ***Journal of Financial Economics***, 20: 317-346.

James, H. S. 1999. Owner as manager, extended horizons and the family firm. ***International Journal of the Economics of Business***, 6: 41-55.

Johnson, H. T., & Kaplan, R. S. 1987. ***Relevance lost***. Boston: Harvard Business School Press.

Jacobs, M. T. 1991. ***Short-term America: the causes and cures of our business myopia***. Boston: Harvard Business School Press.

Jensen, M. C., & Meckling, W. H. 1976. Theory of the firm: managerial behaviour, agency costs and ownership structure. ***Journal of Financial Economics***, 3: 305-360.

Jensen, M. C., & Meckling, W. H. 1994. The nature of man. ***Journal of Applied Corporate Finance***, 7: 4-19.

Kahnemann, D., & Tversky, A. 1979. Prospect theory: an analysis of decision under risk. ***Econometrica***, 47: 263-292.

Kets de Vries, M. F. R. 1993. The dynamics of family controlled firms: The good and the bad news. ***Organizational Dynamics,*** 21(3): 59-71.

Klein, S. B., Astrachan, J. H., & Smyrnios, K. X. 2005. The F-PEC scale of family influence: construction, validation, and further implication for theory. ***Entrepreneurship Theory and Practice***, 29: 321-339.

Klein, S. B., & Bell, F. A. 2007. Non-family executives in family businesses – A literature review. ***Electronic Journal of Family Business Studies***, I: 19-37.

Koop, G. 2003. ***Bayesian Econometrics***. Chicester: John Wiley & Sons Ltd.

La Porta, R., Lopez-De-Silanes, F., & Shleifer, A. 1999. Corporate ownership around the world. ***The Journal of Finance***, 54: 471-517.

Lancaster, T. 2004. ***An introduction to modern bayesian econometrics***. Oxford: Blackwell Publishing.

Laverty, K. J. 1993. How valid are R&D measures in empirical tests of "short-terminism"? ***Academy of Management Best Papers Proceedings***: 27-31.

Laverty, K. J. 1996. Economic "short-terminism": the debate, the unresolved issues, and the implications for management practice and research. ***Academy of Management Review***, 21: 825-860.

Lawler, E. E. 1986. ***High involvement management***. San Francisco: Jossey-Bass.

Leamer, E. E. 1973. Multicollinearity: A Bayesian interpretation. ***Review of Economics and Statistics,*** LV: 371-380.

Le Breton-Miller, I., & Miller, D. 2006. Why do some family businesses out-compete? Governance, long-term orientation, and sustainable capability, ***Entrepreneurship Theory and Practice***, 30: 731-746.

Lee, P. M., & O'Neill, H. M. 2003. Ownership structures and R&D investments of U.S. and Japanese Firms: agency and stewardship perspectives. ***Academy of Management Journal***, 46: 212-225.

Loewenstein, G., & Thaler, R. 1989. Anomalies: intertemporal choice. ***Journal of Economic Perspectives***, 3 (4): 181-193.

Maug, E. 1998. Large shareholders as monitors: is there a trade-off between liquidity and control?, ***Journal of Finance***, 53: 65-98.

Miller, D., & Le Breton-Miller, I. 2005. ***Managing for the long run - Lessons in competitive advantage from great family businesses.*** Boston: Harvard Business School Press.

Narayanan, M. P. 1985. Managerial incentives for short-term results. ***Journal of Finance***, 40: 1469-1484.

Porter, M. E. 1992. Capital disadvantage: America's failing capital investment system. ***Harvard Business Review***, 70:65-82.

Thakor, A. V. 1990. Investment myopia and the internal organization of capital allocation decisions. ***Journal of Law, Economics and Organization***, 6: 129-154.

The Economist. 2000. In praise of Bayes. Print edition from Sep. 28th, 2000.

Rossi, P. E., & Allenby, G. M. 2003. Bayesian statistics and marketing. ***Marketing Science***, 22: 304-328.

Schulze, W. S., Lubatkin, M. H., Dino, R. N., & Buchholtz, A. K. 2001. Agency relationships in family firms: theory and evidence. ***Organization Science***, 12: 99-116.

Schulzendorff, D. V. 1984. ***Fremdmanager in Familienunternehmen – Eine empirische Analyse***. Dissertation No. 922, Hochschule St. Gallen, Switzerland.

Shleifer, A., & Vishny, R. 1986. Large shareholders and corporate control. ***Journal of Political Economy***, 94: 461-488.

Stein, J. 1988. Takeover threats and managerial myopia. ***Journal of Political Economy***, 96: 61-80.

Tagiuri, R., & Davis, J. A. 1992. On the goals of successful family businesses. ***Family Business Review***, 5: 43-62.

Villalonga, B., & Amit, R. 2006. How do family ownership, control and management affect firm value? ***Journal of Financial Economics***, 80: 385-417.

von Neumann, J., & Morgenstern, O. 1953. ***Theory of games and economic behavior*** (3rd ed.). Princeton, NJ: Princeton University Press.

Ward, J. 2004. ***Perpetuating the family business***. Marietta, GA: Family Enterprise Publishers.

APPENDIX

Detailed Description of Bayesian Analysis

For the prior distribution of the individual effects, we choose a uniform distribution. This corresponds to a fixed-effects model specification in classical econometrics. For the coefficients, we assume a normally distributed prior with a mean of zero for all coefficients. Such a prior specification would imply that our model has no explanatory power at all, which one may interpret as a prior specification against the theory developed in the text. This ensures that any evidence for the validity of our theory is not induced by the specification of the prior. Furthermore, our particular prior specification ensures that the posterior distributions functions are identifiable, i.e. we do not end up with a flat posterior distribution (Koop, 2003, p. 291). Finally, the prior of the variance is assumed to follow a χ^2 distribution, which is consistent with the assumption of normally distributed error terms.

As a check of the robustness of the results, we also estimated our model with different prior specifications. We allowed for different means and variances in the normal distribution and for different classes of distributions such as a uniform distribution. Regardless of the prior specifications chosen, we obtained basically the same results.

For the estimation, we used a Matlab code which takes 10,000 draws from the posterior distribution. As the estimation ends up in a multidimensional posterior distribution, we applied the Gibbs Sampler to arrive at the corresponding univariate distributions of the coefficients shown in Table 5 and 6, respectively. The Matlab code is available from the correspondence author.

TABLE 1
Family and Non-family Firms by Industry[a]

SIC Code	Industry Description	Median of R&D/ assets	Median of capital expen-ditures/ assets	Family Firms	Non-family Firms	Obs. of Family Firms
28	Chemical and allied products	4.70%	5.46%	43 Obs.	105 Obs.	29.05%
35	Industrial machinery and equipment	4.01%	5.75%	40 Obs.	73 Obs.	35.40%
36	Electronic and other electrical equipment	8.06%	8.26%	72 Obs.	66 Obs.	52.17%
37	Transportation equipment	2.84%	4.55%	16 Obs.	50 Obs.	24.24%
38	Instruments and related products	6.26%	4.25%	33 Obs.	58 Obs.	36.26%
73	Business services	10.58%	3.85%	51 Obs.	32 Obs.	61.45%
				255 Obs.	384 Obs.	39.91%

[a] The broad definition of a family firm is applied.

TABLE 2
Description of Variables

Variables	Description
R&D/assets	R&D expenditures (in million $) divided by total assets (in million $)
Capital expendi-tures/assets	Capital expenditures (in million $) divided by total assets (in million $)
Family firm *	Dummy = 1 if family owns more than 5% of voting stock or either CEO or chairman is from family [broad definition]
	Dummy = 1 if family owns more than 5% of voting stock and either CEO or chairman is from family [narrow definition]
Cash flow/assets *	In R&D regressions: sum of after-tax income, depreciation and after-tax R&D divided by total assets
	In capital expenditures regressions: sum of after-tax income, depreciation and capital ex-penditures divided by total assets
Market-to-book ratio *	Sum of market value of equity (in million $) and book value of debt (in million $) divided by book value of total assets (in million $)
Firm size *	Log (total assets)
Leverage *	Long-term debt (in million $) divided by total assets (in million $)
Age of company	Log (number of years the company exists)
Industry dummies	Dummy variables indicating observations in either SIC industry 28, 35, 36, 37, 38 or 73
Time dummies	Dummy variables indicating year of observation (1995-1999)

* To avoid problems of endogeneity in the multivariate analysis, these variables are lagged by one year.

TABLE 3
Comparison of Family and Non-family Firms [a]

	Non-family Firms (N= 87)					Family Firms (N= 66)						
	Mean	**S.D.**	**Lower Quartile**	**Median**	**Upper Quartile**	**Mean**	**S.D.**	**Lower Quartile**	**Median**	**Upper Quartile**	**2 sided t-test for equality of means (p-value)**	**Wilcoxon rank-sum test (p-value)**
Pretax return on assets (in %)	11.40	7.81	5.96	10.61	16.50	15.72	10.45	9.07	14.77	22.90	0.40 %	0.42%
Pretax return on equity (in %)	27.20	29.17	17.60	26.76	35.81	28.01	18.77	19.11	30.10	40.34	84.60%	49.63%
R&D/assets (in %)	6.70	5.60	2.52	5.41	10.45	9.49	7.94	4.69	8.93	13.26	0.30%	0.38%
Capital expen-ditures/assets (in %)	6.44	3.37	4.37	5.69	7.69	6.17	3.97	3.29	5.43	7.87	64.46%	25.96%
Cash flow/ assets [b, c] (in %)	14.98	5.87	10.74	13.87	18.99	19.44	9.40	14.06	18.55	23.08	< 0.1%	< 0.1%
Market-to-book ratio [b]	2.28	1.72	1.13	1.71	2.78	4.39	4.73	2.18	3.42	5.45	< 0.1%	< 0.1%
Firm size [b,] (in bn $)	10.35	25.82	14.59	38.92	95.14	7.67	31.03	6.17	11.92	35.60	< 0.1%	56.08%
Leverage [b] (in %)	20.56	12.66	11.19	19.30	29.67	13.29	15.65	0.41	7.92	18.31	0.18%	< 0.1%
Age of com-pany [b] (in years)	70.43	44.81	20.5	76.5	100	33.30	36.31	13.5	18.5	40.5	< 0.1%	< 0.1%

[a] Data for the univariate statistics are based on time series averages for each firm, and then averages were taken across firms. A firm is classified as a family firm if it has more family than non-family observations and vice versa. The broad definition of a family firm is used.
[b] These variables are lagged by one year. The reason is that they go into the multivariate analyses as lagged values.
[c] Computed in the way the variable goes into the R&D regression (see Table 2).

TABLE 4
Characteristics of Family Firm Observations in the Estimation Sample (N=255) [a]

Firm Governance	
Family owns more than 5% of voting stock	51.76%
Family owns more than 20% of voting stock	18.04%
CEO belongs to family	65.1%
Chairman belongs to family	70.2%
CEO or chairman belongs to family	76.86%
Family owns more than 5% of voting stock and CEO or chairman belongs to family (narrow definition)	27.45%
Founder is CEO	43.53%
Founder is chairman	49.02%
Founder is CEO or chairman	54.51%
CEO is chairman	73.33%

Firm Characteristics	**Mean**	**S.D.**	**Median**	**Min.**	**Max.**
Company age (in years)	39.35	38.88	22	3	197
Total assets (in bn $)	10.39	36.58	1.77	0.15	279.10
Sales (in bn $)	7.95	21.94	1.45	0.04	162.56
Employees (in 1,000)	24.25	55.32	6.93	0.16	371.70

[a] The broad definition of a family firm is applied.

TABLE 5
Results of Bayesian Regression Analyses on R&D/Assets [a, b]

Variables	Broad Definition of Family Firm		Narrow Definition of Family Firm	
	Median marginal effect	Probability of positive marginal effect	Median marginal effect	Probability of positive marginal effect
Industry dummies	included as control variables; not reported		included as control variables; not reported	
Time dummies	included as control variables; not reported		included as control variables; not reported	
Family firm $_{t-1}$	-0.0178	6.61%	0.0097	90.68%
(Cash flow/assets) $_{t-1}$	-0.1549	40.84%	-0.5089	23.20%
Firm size $_{t-1}$	0.0061	82.82%	0.0044	75.27%
Leverage $_{t-1}$	0.0245	81.69%	0.0149	70.82%
Age of company	0.1056	87.24%	0.1115	89.91%
Market-to-book ratio $_{t-1}$	-0.1321	0%	-0.1313	0%
(Cash flow/assets) $_{t-1}$ x family firm $_{t-1}$	-0.0407	18.29%	-0.0963	1.84%
(Cash flow/assets) $_{t-1}$ x control variables [c]	included as control variables; not reported		included as control variables; not reported	

[a] N=639 Observations including 255 family firm observations (broad definition) or 70 family firm observations (narrow definition), respectively
[b] We use normally distributed priors with of mean of zero and a standard deviation of one.
The use of alternative priors however does not change the results in a substantial way.
[c] Control variables: (cash flow/assets) x market-to-book ratio, (cash flow/assets) x leverage, (cash flow/assets) x age of company, (cash flow/assets) x industry dummies, (cash flow/assets) x time dummies.

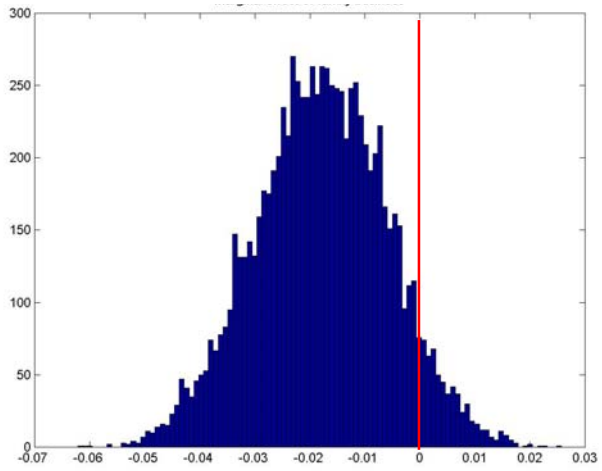
TABLE 6
Results of Bayesian Regression Analyses on Capital Expenditures/Assets [a, b]

Variables	Broad Definition of Family Firm		Narrow Definition of Family Firm	
	Median marginal effect	Probability of positive marginal effect	Median marginal effect	Probability of positive marginal effect
Industry dummies	included as control variables; not reported		included as control variables; not reported	
Time dummies	included as control variables; not reported		included as control variables; not reported	
Family firm $_{t-1}$	-0.0103	6.78%	0.0028	64.50%
(Cash flow/assets) $_{t-1}$	0.0028	50.46%	0.2335	85.20%
Firm size $_{t-1}$	0.0005	55.69%	0.0005	56.90%
Leverage $_{t-1}$	-0.0034	44.21%	-0.0119	31.42%
Age of company	0.0372	100.00%	0.0366	100.%
Market-to-book ratio $_{t-1}$	0.0331	99.47%	0.0313	99.40%
(Cash flow/assets) $_{t-1}$ x family firm $_{t-1}$	-0.0622	1.43%	-0.0729	3.17%
(Cash flow/assets) $_{t-1}$ x control variables [c]	included as control variables; not reported		included as control variables; not reported	

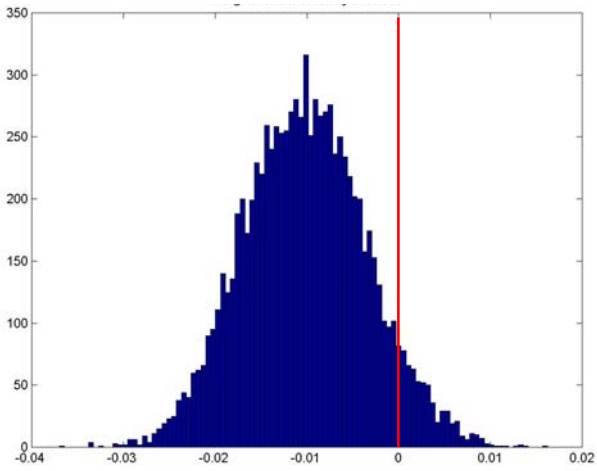
[a] N=639 Observations including 255 family firm observations (broad definition) or 70 family firm observations (narrow definition), respectively
[b] We use normally distributed priors with a mean of zero and a standard deviation of one.
The use of alternative priors however does not change the results in a substantial way.
[c] Control variables: (cash flow/assets) x market-to-book ratio, (cash flow/assets) x leverage, (cash flow/assets) x age of company, (cash flow/assets) x industry dummies, (cash flow/assets) x time dummies.

FIGURE 1
Distribution of Marginal Effect of *Family Firm* [a]

R&D Expenditures Regression (Table 5)



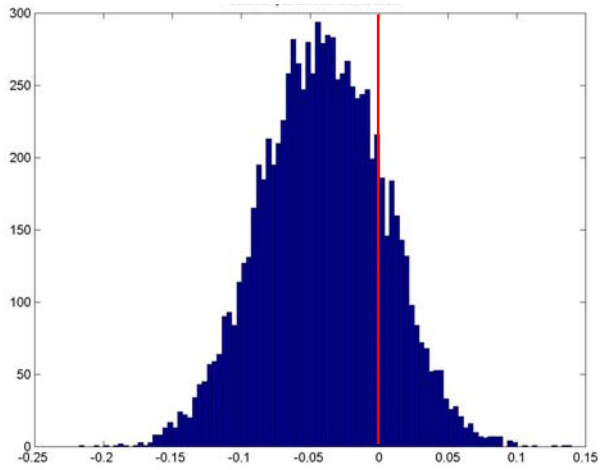
Capital Expenditures Regression (Table 6)



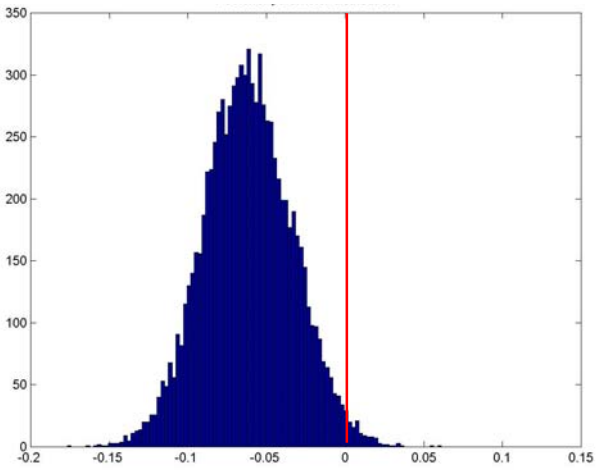
[a] The broad definition of a family firm is applied.

FIGURE 2
Distribution of Marginal Effect of *Family Firm x (Cash Flow/Assets)* [a]

R&D Expenditures Regression (Table 5)



Capital Expenditures Regression (Table 6)



[a] The broad definition of a family firm is applied.

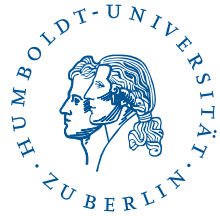
SFB 649 Discussion Paper Series 2007

For a complete list of Discussion Papers published by the SFB 649, please visit http://sfb649.wiwi.hu-berlin.de.

001 "Trade Liberalisation, Process and Product Innovation, and Relative Skill Demand" by Sebastian Braun, January 2007.
002 "Robust Risk Management. Accounting for Nonstationarity and Heavy Tails" by Ying Chen and Vladimir Spokoiny, January 2007.
003 "Explaining Asset Prices with External Habits and Wage Rigidities in a DSGE Model." by Harald Uhlig, January 2007.
004 "Volatility and Causality in Asia Pacific Financial Markets" by Enzo Weber, January 2007.
005 "Quantile Sieve Estimates For Time Series" by Jürgen Franke, Jean-Pierre Stockis and Joseph Tadjuidje, February 2007.
006 "Real Origins of the Great Depression: Monopolistic Competition, Union Power, and the American Business Cycle in the 1920s" by Monique Ebell and Albrecht Ritschl, February 2007.
007 "Rules, Discretion or Reputation? Monetary Policies and the Efficiency of Financial Markets in Germany, 14th to 16th Centuries" by Oliver Volckart, February 2007.
008 "Sectoral Transformation, Turbulence, and Labour Market Dynamics in Germany" by Ronald Bachmann and Michael C. Burda, February 2007.
009 "Union Wage Compression in a Right-to-Manage Model" by Thorsten Vogel, February 2007.
010 "On σ−additive robust representation of convex risk measures for unbounded financial positions in the presence of uncertainty about the market model" by Volker Krätschmer, March 2007.
011 "Media Coverage and Macroeconomic Information Processing" by Alexandra Niessen, March 2007.
012 "Are Correlations Constant Over Time? Application of the CC-TRIG$_t$-test to Return Series from Different Asset Classes." by Matthias Fischer, March 2007.
013 "Uncertain Paternity, Mating Market Failure, and the Institution of Marriage" by Dirk Bethmann and Michael Kvasnicka, March 2007.
014 "What Happened to the Transatlantic Capital Market Relations?" by Enzo Weber, March 2007.
015 "Who Leads Financial Markets?" by Enzo Weber, April 2007.
016 "Fiscal Policy Rules in Practice" by Andreas Thams, April 2007.
017 "Empirical Pricing Kernels and Investor Preferences" by Kai Detlefsen, Wolfgang Härdle and Rouslan Moro, April 2007.
018 "Simultaneous Causality in International Trade" by Enzo Weber, April 2007.
019 "Regional and Outward Economic Integration in South-East Asia" by Enzo Weber, April 2007.
020 "Computational Statistics and Data Visualization" by Antony Unwin, Chun-houh Chen and Wolfgang Härdle, April 2007.
021 "Ideology Without Ideologists" by Lydia Mechtenberg, April 2007.
022 "A Generalized ARFIMA Process with Markov-Switching Fractional Differencing Parameter" by Wen-Jen Tsay and Wolfgang Härdle, April 2007.

SFB 649, Spandauer Straße 1, D-10178 Berlin
http://sfb649.wiwi.hu-berlin.de

This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 "Economic Risk".



023 "Time Series Modelling with Semiparametric Factor Dynamics" by Szymon Borak, Wolfgang Härdle, Enno Mammen and Byeong U. Park, April 2007.
024 "From Animal Baits to Investors' Preference: Estimating and Demixing of the Weight Function in Semiparametric Models for Biased Samples" by Ya'acov Ritov and Wolfgang Härdle, May 2007.
025 "Statistics of Risk Aversion" by Enzo Giacomini and Wolfgang Härdle, May 2007.
026 "Robust Optimal Control for a Consumption-Investment Problem" by Alexander Schied, May 2007.
027 "Long Memory Persistence in the Factor of Implied Volatility Dynamics" by Wolfgang Härdle and Julius Mungo, May 2007.
028 "Macroeconomic Policy in a Heterogeneous Monetary Union" by Oliver Grimm and Stefan Ried, May 2007.
029 "Comparison of Panel Cointegration Tests" by Deniz Dilan Karaman Örsal, May 2007.
030 "Robust Maximization of Consumption with Logarithmic Utility" by Daniel Hernández-Hernández and Alexander Schied, May 2007.
031 "Using Wiki to Build an E-learning System in Statistics in Arabic Language" by Taleb Ahmad, Wolfgang Härdle and Sigbert Klinke, May 2007.
032 "Visualization of Competitive Market Structure by Means of Choice Data" by Werner Kunz, May 2007.
033 "Does International Outsourcing Depress Union Wages? by Sebastian Braun and Juliane Scheffel, May 2007.
034 "A Note on the Effect of Outsourcing on Union Wages" by Sebastian Braun and Juliane Scheffel, May 2007.
035 "Estimating Probabilities of Default With Support Vector Machines" by Wolfgang Härdle, Rouslan Moro and Dorothea Schäfer, June 2007.
036 "Yxilon – A Client/Server Based Statistical Environment" by Wolfgang Härdle, Sigbert Klinke and Uwe Ziegenhagen, June 2007.
037 "Calibrating CAT Bonds for Mexican Earthquakes" by Wolfgang Härdle and Brenda López Cabrera, June 2007.
038 "Economic Integration and the Foreign Exchange" by Enzo Weber, June 2007.
039 "Tracking Down the Business Cycle: A Dynamic Factor Model For Germany 1820-1913" by Samad Sarferaz and Martin Uebele, June 2007.
040 "Optimal Policy Under Model Uncertainty: A Structural-Bayesian Estimation Approach" by Alexander Kriwoluzky and Christian Stoltenberg, July 2007.
041 "QuantNet – A Database-Driven Online Repository of Scientific Information" by Anton Andriyashin and Wolfgang Härdle, July 2007.
042 "Exchange Rate Uncertainty and Trade Growth - A Comparison of Linear and Nonlinear (Forecasting) Models" by Helmut Herwartz and Henning Weber, July 2007.
043 "How do Rating Agencies Score in Predicting Firm Performance" by Gunter Löffler and Peter N. Posch, August 2007.

This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 "Economic Risk".

044 "Ein Vergleich des binären Logit-Modells mit künstlichen neuronalen Netzen zur Insolvenzprognose anhand relativer Bilanzkennzahlen" by Ronald Franken, August 2007.
045 "Promotion Tournaments and Individual Performance Pay" by Anja Schöttner and Veikko Thiele, August 2007.
046 "Estimation with the Nested Logit Model: Specifications and Software Particularities" by Nadja Silberhorn, Yasemin Boztuğ and Lutz Hildebrandt, August 2007.
047 "Risiken infolge von Technologie-Outsourcing?" by Michael Stephan, August 2007.
048 "Sensitivities for Bermudan Options by Regression Methods" by Denis Belomestny, Grigori Milstein and John Schoenmakers, August 2007.
049 "Occupational Choice and the Spirit of Capitalism" by Matthias Doepke and Fabrizio Zilibotti, August 2007.
050 "On the Utility of E-Learning in Statistics" by Wolfgang Härdle, Sigbert Klinke and Uwe Ziegenhagen, August 2007.
051 "Mergers & Acquisitions and Innovation Performance in the Telecommunications Equipment Industry" by Tseveen Gantumur and Andreas Stephan, August 2007.
052 "Capturing Common Components in High-Frequency Financial Time Series: A Multivariate Stochastic Multiplicative Error Model" by Nikolaus Hautsch, September 2007.
053 "World War II, Missing Men, and Out-of-wedlock Childbearing" by Michael Kvasnicka and Dirk Bethmann, September 2007.
054 "The Drivers and Implications of Business Divestiture – An Application and Extension of Prior Findings" by Carolin Decker, September 2007.
055 "Why Managers Hold Shares of Their Firms: An Empirical Analysis" by Ulf von Lilienfeld-Toal and Stefan Ruenzi, September 2007.
056 "Auswirkungen der IFRS-Umstellung auf die Risikoprämie von Unternehmensanleihen - Eine empirische Studie für Deutschland, Österreich und die Schweiz" by Kerstin Kiefer and Philipp Schorn, September 2007.
057 "Conditional Complexity of Compression for Authorship Attribution" by Mikhail B. Malyutov, Chammi I. Wickramasinghe and Sufeng Li, September 2007.
058 "Total Work, Gender and Social Norms" by Michael Burda, Daniel S. Hamermesh and Philippe Weil, September 2007.
059 "Long-Term Orientation in Family and Non-Family Firms: a Bayesian Analysis" by Jörn Hendrich Block and Andreas Thams, October 2007

This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 "Economic Risk".