Ownership versus Management Effects on Performance in Family and Founder Companies: A Bayesian Analysis

Joern, Block and Peter, Jaskiewicz and Danny, Miller

Erasmus University Rotterdam

21 June 2010

Ownership versus Management Effects on Performance in Family and Founder Companies: A Bayesian Analysis

Joern H. Block [a], Peter Jaskiewicz [b], Danny Miller [c]

[a] Post-doctoral Fellow; Centre for Advanced Small Business Economics, Erasmus School of Economics, Erasmus University Rotterdam and Technische Universität München, Schöller Chair in Technology and Innovation Management, Germany; P.O. Box 1738, 3000 DR Rotterdam, the Netherlands; phone +31 104-081-004; fax: +31 104-089-141; block@ese.eur.nl

[b] Assistant Professor; Department of Strategic Management & Organization, 4-30 Q Business Building, School of Business, University of Alberta, Edmonton, Alberta, Canada T6G 2R6; phone: +1 780-248-1375; fax: +1 780-492-3325; peter.jaskiewicz@ualberta.ca

[c] Rogers-J.A.-Bombardier Chair of Entrepreneurship; HEC Montreal and University of Alberta; 3000 Cote Ste. Catherine Road, Montreal, Canada H3T 2A7; Phone: +1 514-340-6501; fax: +1 514-340-6382; danny.miller@hec.ca

Corresponding author: Joern Block

Abstract

There are ongoing debates in the literature concerning the performance of family firms: some studies find superior performance among these companies, others find negative or neutral performance effects. In this research we employ agency theory to argue that the effects of family ownership vs. family management will be quite different: the former is expected to contribute positively to performance, the latter is argued to erode performance. Previous studies, due to problems of omitted variables or multicollinearity have been unable to distinguish these effects. Using a Bayesian approach that avoids these problems, we find that whereas family and founder ownership are associated with superior performance, the results for family management and even founder management are far more ambiguous. Our results have implications regarding the ownership and management of lone founder and family firms.

Keywords: Family firms; lone founder firms; performance; Bayesian analysis; agency theory

"In general the wisest course for any business, family or nonfamily, is to move to professional management as quickly as possible" Levinson (1971, pp. 98).

1. Introduction

Previous research on family firm performance has been rife with disagreements, with some studies finding family firms to outperform (e.g. Anderson and Reeb, 2003; McConaughy et al., 1998; Villalonga and Amit, 2006; Weber et al., 2003), others studies finding them to underperform (e.g. Claessens et al., 2002; Holderness and Sheehan, 1988), and others still finding that family firms do not differ in their performance from their non-family cohorts (Miller et al., 2007). Certainly, there has been some discussion that different types of family or lone founder businesses perform differently, depending on the generation of the family involved (e.g., Bennedsen et al., 2007; Perez-Gonzales, 2006) and the number of family members (Miller et al., 2007). Founder generation firms and those with a single founder present are said to outperform other "family" businesses. Results also vary according to the samples (Fortune 500/ 1000 vs. S&P 500) and periods studied, and the indicators of performance – market to book ratio (Tobin's q) versus return on assets.

We believe that for both theoretical and methodological reasons, one very important source of the conflicting findings on the performance of family firms has been ignored: namely that family ownership and family management have very different, and perhaps even opposite effects on performance. The theoretical rationale is as follows. Agency theory would suggest that concentrated ownership is associated with lower agency costs. Specifically, the monitoring power and incentives of major owners reduces information asymmetries between owners and managers, minimizing the chances that managers will misallocate firm resources to serve selfish pur-

poses (Demsetz, 1988; Jensen and Meckling, 1976). Because family firms have concentrated ownership, they will benefit from lower agency costs and outperform. However, those advantages may be absent under – or even negated by – family *management*. Family managers may decide to use the resources of the business for the particular benefit of their own families, and in the process oppress smaller shareholders (Morck et al., 2005; Shleifer and Vishny, 1997). They may also be less competent than outsiders as they are relatively immune to dismissal for incompetence and come from a smaller selection pool (Burkart et al., 2003; Claessens et al., 2002; Volpin, 2002). In short, there are good conceptual reasons for believing that family ownership and family management may exert opposing influences on performance. The same might be said for lone founder ownership and management, which may be why founders are often released after their firms go public (Shleifer and Vishny, 1997). Our argument is not only of conceptual significance it also has practical governance implications regarding ownership and management of lone founder and family firms.

Our second concern is methodological. Although prior studies have taken into account both ownership and management, they have been required to do so in separate predictive models given the high correlations among family ownership and management (usually between 0.5 and 0.7). Typically, the results for ownership and management have converged, we suspect because of that high correlation (Anderson and Reeb, 2003; Miller et al., 2007; Villalonga and Amit, 2006). Unfortunately, there may well be a confounding effect at work here: any perceived advantage to family (or founder) management might actually be due to family (or founder) ownership. As we have argued above, there may *not be* any advantage to family management. In short, whereas family and founder ownership reduce agency costs, family and founder management may

negate those advantages. Thus these two dimensions of governance may have very different effects on performance.

As noted, because of the high correlation between family/ founder ownership and family/ founder management, previous research, using conventional methods of regression, has confounded these influences. The present study will avoid that problem by using Bayesian regression analyses which are able to encompass ownership and management in the same models, without incurring problems of multicollinearity. Bayesian methods also have an advantage in that their results are not *point estimates* but *entire distribution functions* of the effects of interest. Bayesian analysis allows statements of likely and unlikely effects. Thus, we are able to specify the probability of family and founder management and family and founder ownership having positive effects rather than merely reporting a regression coefficient which is either significant or not. That way, Bayesian analysis avoids the danger of non-significant, but potentially important, results not being reported (Cohen, 1994; Schmidt, 1996; Starbuck, 2006).

This study of S&P 500 companies between 1994 and 2003 shows that over 90% of the time, a higher level of family or founder ownership leads to outperformance. By contrast, family managed companies are outperformed *by* their non family managed companies in over 50% of the cases, although lone-founder CEOs do somewhat better than that. In short, family influences are Janus-faced: ownership effects are positive, management effects ambiguous, or even negative. Subsequent studies would be well advised to take those differences into account.

We shall first elaborate agency arguments for the performance advantages of family and founder ownership, and then argue for the performance disadvantages of family and founder management. Then we shall present our sample and methods, describing the particular appropriateness of Bayesian regressions in eliminating the multicollinearity problem that has affected all

prior studies in this domain. We conclude by presenting and discussing our results and their implications.

2. Hypotheses

Following the practice of Miller et al. (2007), we shall distinguish between family and lone founder owned firms; we shall also distinguish between family and lone founder managed firms.

2.1 Agency Arguments Concerning Family and Founder Ownership

The central contention of agency theory is that ownership concentration enhances performance. Large owners have both the incentive and the power to effectively monitor their managerial agents, and thereby reduce information asymmetries between themselves and their managers. This reduces agency costs and thus enhances performance (Demsetz, 1988; Fama, 1980; Jensen and Meckling, 1976). This has been borne out in numerous empirical analyses (see the reviews of Shleifer and Vishny, 1997; and Morck et al., 2005). Compared to more remote shareholders, family or founder owners often are better able to understand their businesses because of their more intimate connections to the firm. Their significant ownership also gives them access to information. This may be especially true where the founders are still present as major owners as their experience with the company lends them particular expertise (Ward, 2004). Finally, major family and founder owners have the incentive to monitor the business closely. They have a great deal of their fortune and their family's future invested there, and that induces many of these owners to become careful stewards of their companies (Anderson and Reeb, 2003; Villalonga and Amit, 2006). Thus both, lone founder and family owners should be beneficial to firm per-

formance from an agency perspective. Following the conventional agency rationale, we suggest the following hypothesis:

> *Hypothesis 1: Family and founder ownership will be positively associated with superior performance.*

2.2 Agency Arguments Concerning Family and Founder Management

Certainly, it can be argued that founder or family management can have a positive effect on performance. Founders or family executives may have profound knowledge about the businesses to which they have long been attached (Miller and Le Breton-Miller, 2005). They may also have an incentive to perform well as poor performance may erode family reputation or incur the disapproval of other family owners (Arrègle et al., 2007).

But there are a different, more negative set of forces at work when founders or their family members run public companies. These sometimes fall under the heading of entrenchment (Shleifer and Vishny, 1997; Volpin 2002) – a situation in which a member of the founding family or founder acting as a powerful manager may divert the resources of the firm to personal benefit (Morck et al., 2005). For example, the manager may extract pecuniary benefits for himself or his family. He may make business decisions that favor cronies of the family or that enhance personal reputation in the community at the expense of the company. He may hire incompetent relatives for key positions (Bloom and Van Reenen, 2007; Perez-Gonzales, 2006). All of these things can erode performance. They are made more serious because founder or family executives often have the power to entrench themselves in the company: they or their relatives may have enough shares or votes to keep themselves in office despite their poor performance (Burkart et al., 2003; Claessens et al., 2002). Thus lone founder or family managers may be reluctant to let go of firm leadership when their business outgrows their skills or capabilities (Boeker and Kari-

chalil, 2002). Family successors, moreover, might lack the talent of outsiders drawn from a far larger talent pool (Bennedsen et al., 2007; Mehrotra et al., 2009) especially if they are entitled to management positions simply because of kinship (Perez-Gonzalez, 2006; Bloom & Van Reenen, 2007). All of these factors suggest that the negative aspects of family and founder management may counteract or even outweigh the positive ones.

Hypothesis 2: Family and founder management will be negatively associated with superior performance.

3. Data and Sample

3.1 Sample Composition

Our sample consisted of the Standard & Poor's 500 firms. We manually collected firm ownership and top management composition data from corporate proxy statements submitted to the US Securities and Exchange Commission (SEC) for the years 1994 to 2003. The Securities Exchange Act of 1934 requires officers, directors, and five-percent owners to disclose their holdings. Proxy statements have been found to be the most accurate sources of information about corporate ownership structures in general (Anderson and Lee, 1997; Dlugosz et al., 2006).

In addition to analyzing firm proxies to identify founder and family ownership and management, to resolve any ambiguities, we gathered information from Hoover's Handbook of American Business, Gale Business Resources, a Business Week list of family firms (of November 10th 2003), the Twentieth-Century American Business Leaders Database at Harvard Business School, Forbes Lists of the 400 Richest Americans, Marquis Who's Who in America, and information available on the respective corporation's website for each of the 10 years of the study. Our final sample constitutes an unbalanced panel data set with 3,058 observations from 419

firms. Any missing firm-year observations are due to missing data and the fact that some firms were not listed on the stock exchange over the entire period from 1994-2003.

Approximately 37% of the observations in our sample fall into the categories of family or founder firms. Descriptive data on the industry representation of family firms in the sample are reported in Table 1.

- Insert Table 1 here -

3.2 Variables and Measurement

Dependent variable

Our dependent variable is Tobin's q – 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 (Chung and Pruitt, 1994). Due to its skewed distribution, we log that variable in our analyses. Tobin's q is deemed a useful indicator of firm performance as it represents the valuation of a firm as it is determined by all market participants based on their evaluation of a firm and its prospects (Villalonga and Amit, 2006). As such, it is more resistant than return measures to accounting anomalies and earnings manipulations.

Independent variables

We measure family involvement by ownership stake and role in top management. *Ownership by lone founder* was measured as the percentage of common equity solely owned by the founder or a founder team where no relatives of these individuals served as major owners or officers of the

company.[1] *Ownership by family* is the percentage of common equity owned by one or several founding family members, where relatives of the founder served as major owners or officers of the company. The variables *ownership by family* and *ownership by lone founder* are mutually exclusive. A family-owned firm cannot be a founder-owned firm and vice versa. The management variables were constructed in a similar way: The dummy variable *management by lone founder* reflects the founder of the company serving as CEO and/or chairman. The dummy variable *management by family* indicates that a member of the founding family other than the founder serves as CEO and/or chairman. Whereas lone founder predictors solely refer to first generation firms, family predictors can also reflect later family generation firms. Our sample contained too few true first generation family firms to merit or permit separate analyses (N=11 firms). This is because what previous studies classify as first generation family firms are really quite a different breed: namely lone founder firms in which there are no family members of the founder present. Thus, following the convention of Miller et al. (2007), we classify these firms as lone founder firms, as that is what they are. However in assessing the robustness of our findings and for purposes of comparing our results with earlier studies such as Anderson and Reeb (2003) and Villalonga and Amit (2006), we shall assess generational effects in a manner consistent with theirs. Specifically, we will create a first generation category by combining our family first generation firms with our lone founder firms. We then will distinguish the performance of this group from that of later generation family firms.

[1] The proxy statements report all shareholders with more than 5% of stock. Shareholders with less than 5% are not reported unless they are also active as board members.

Control variables

Firm specific control variables were chosen based on previous studies by Anderson and Reeb (2003) and Villalonga and Amit (2006) and mostly taken from COMPUSTAT Industrial Files. Firm age is the number of years since the firm's foundation and controls for differences in firm life cycles. Firm size is the book value of total assets. As the distributions of size and age are skewed, logarithmic values are used. To control for the firm's capital structure we use the ratio of the book value of debt to the market value of equity. R&D effects are measured by R&D expenditures divided by total assets. So as not to confound the effects of the sales variable with the effects of R&D, we used total assets instead of sales as our denominator on both sides of the regression equation. This conforms with prior studies of the effects of R&D expenditures on market value (Hall, 1993; Hall and Oriani, 2006). The variable advertising/ assets represents advertising expenses divided by total assets. Due to their skewed distributions, we logged both the R&D and the advertising variables. Investment intensity is assessed as capital expenditures divided by property, plant, and equipment (CAPX/PPE). Our risk measure is calculated as the annual variance of daily stock returns, obtained from the CRSP database (Center for Research on Security Prices, University of Chicago).

Based on previous findings on the impact of governance arrangements on corporate performance (e.g., Shleifer and Vishny, 1997; Villalonga and Amit, 2006), we also control for the separation of voting from cashflow rights and for the presence of non-family blockholders. We use the dummy *supershares* to account for firms which use different share classes to split voting from cashflow rights. Since large non-family blockholders can provide a valuable monitoring role, we include a variable that measures the percentage of stock owned by large banks, insurance companies, mutual funds, private equity firms and large individual financial investors. In

addition, we have controlled for industry in two ways: dummy variables based on 2-digit SIC codes for the 53 different industries in the sample (Tables 4 and 6), and market-to-book values for each industry sector (Tables 5 and 7). Finally, time dummies for the years 1994-2003 are included in some models to control for macro-economic effects (Tables 4 and 6). Table 2 defines the variables in detail.

- Insert Table 2 here -

4. Method

4.1 The Bayesian Approach

There are two fundamental approaches to statistics: the traditional "classical" approach of null hypothesis significance testing and the Bayesian approach. In contrast to the classical approach, the product of a Bayesian analysis is the entire distribution function of an effect of interest, which permits a researcher to be very precise about the degree of support for a particular hypothesis. Yet, due to computational difficulties, the Bayesian approach has been less often used, and is therefore less known. Bayesian statistics rely on Bayes' theorem of probability theory (Bayes, 1763):

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

where θ represents the set of unknown parameters and y represents the data. $\Pr(\theta)$ is the prior distribution of the parameter set θ, which 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* giv-

en the unknown parameter set 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 set θ given the data y. This equation may also be written as

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

where $\propto$ means 'proportional to'. The posterior distribution is proportional to the likelihood function multiplied by the prior distribution. In Bayesian statistics, inference comes from the posterior distribution, which states the likelihood of a particular parameter value.

When testing a hypothesized relationship between two variables, Bayesian analysis proceeds as follows. First, a priori beliefs (from theory) 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 third step, data are used to update these beliefs. The result is the posterior distribution, $\Pr(\theta \mid y)$. This posterior distribution provides a density function of the parameter of interest (i.e., the coefficient that describes the relationship between the two variables). The posterior distribution allows for statements in terms of likely and unlikely parameter values.

4.2 Contrasts with Null Hypothesis Significance Testing

Null hypothesis significance testing has been criticized for various reasons (Cohen, 1994; Schmidt, 1996; Starbuck, 2006). One criticism is that journals almost never publish non-significant results and thereby present a biased picture of the reality. Furthermore, the statistical significance required for publication (in most cases 5%) is arbitrary and has no mathematical ba-

sis. More importantly, overstressing statistical significance draws attention away from the size of the effect and its (economic) relevance − a statistically significant result can almost always be found with a large enough sample.

Bayesian methods represent a useful alternative approach, one that has now become feasible due to today's more powerful software packages. To understand the differences between Bayesian and classical methods, it is important first to recap the basics of null hypothesis significance testing. The null hypothesis testing approach defines a population and draws a sample from it to learn about the value of a particular parameter. The view is that a parameter varies over the population due to sampling variation. The statistician's task is to arrive at the 'true' parameters using the evidence provided by the sample. To achieve this, a sample estimator and an accompanying test statistic are selected, which are known to follow a particular distribution. A comparison of the value of the test statistic and its distribution then leads to a p-value, which is the probability that the hypothesis "the true parameter in the population equals the sample estimator" can be rejected.

The Bayesian approach is different. As noted, the result of Bayesian analysis is a posterior distribution of the parameter of interest. This differs from null hypothesis significance testing in that the outcome of the estimation is not a *point estimate* – which is either statistically significant or not – but an *entire distribution function*. This way, Bayesian analysis allows for statements such as "the probability of a positive effect of a particular independent variable on the dependent variable is 70%". The traditional approach only permits statements such as "the effect of a particular independent variable on the dependent variable is positive; the probability of this statement being erroneous is below 5%." The result of Bayesian analysis is more intuitive in that it states the likelihood that a particular independent variable has a positive effect or not. Bayesian

analysis is *not* tied to the notion of a sample and a population. The result of a Bayesian analysis is a statement about the particular data that is used in the analysis. There is no statement about a 'true' parameter in an underlying distribution (the population).

4.3 Our Motivation to use Bayesian Methods

Bayesian methods are used widely in the biological (e.g., Woodworth, 2004) and medical sciences (e.g., Goodman, 2005). They also have become prevalent in econometric analysis in recent years.[2] First applied in macroeconomics and decision theory, Bayesian methods have found their way to other social sciences, particularly with applications in marketing research.[3] So far however, only few Bayesian studies exist in management research. A rare example is Hansen et al. (2004), who used the approach to operationalize the resource-based view.[4] The use of Bayesian methods can make a contribution to the literature of family firm performance, which, as we have noted, has produced contradictory results. Bayesian methods have two main advantages in this regard:

First, Bayesian statistics offers interpretations that are more intuitive and consistent with theory. Instead of stating whether or not family or lone founder firms have superior performance (thereby rejecting one alternative as being irrelevant), Bayesian statistics give the *probability* that these firms have superior performance. More concretely, the result of Bayesian statistics is an updated belief (i.e., the updated prior distribution) about the distribution of the effect of a particular variable given the information in the data. Thus, given the data and the prior, Bayesian statistics return the exact probability distribution of the effect of a given variable, something not

---

2 See The Economist (2006) for a discussion of the application of Bayesian methods in social sciences.
3 Rossi and Allenby (2003) discuss the potentials of Bayesian statistics in marketing science.
4 Hahn and Doh (2006) discuss the potentials for Bayesian methods in strategy research.

possible with classical statistics where the result is only a point estimate which either is or is not significant.

Second, since Bayesian methods do not rely on significance tests and asymptotic assumptions, they have strong small sample properties and are more robust to multicollinearity problems as compared to classical null hypothesis significance testing (Hahn and Doh, 2006; Leamer, 1973). Multicollinearity is caused by a lack of information in the data. As an extreme example, imagine family ownership and family management were perfectly correlated. Then, neither classical nor Bayesian statistics could disentangle their effects (a Bayesian estimator would simply return the prior). Bayesian statistics, however, do have an advantage when the correlation is less than perfect, but high enough to cause problems with classical significance testing. Say the correlation between family ownership and family management were r=0.7. Using classical statistics, one or both of the estimators would most likely return a non-significant result. The situation is different with Bayesian statistics: if the data are informative – which is likely with a less than perfect correlation between two variables – the posterior distribution will be different from the prior distribution and conclusions could be drawn about the effect of both family management *and* family ownership. This capability allows us to separate the performance effects of family ownership and management, which we have hypothesized to be quite different. Although prior studies have taken into account both ownership and management, they have been required to do so in *separate* predictive models given the high correlations among family ownership and management (in our case about 0.5). Our Bayesian model includes both of these family firm characteristics in the same predictive model and is thereby able to assess the *relative* effect of each upon firm performance.

4.4 Description of the Bayesian Model Estimated

The Bayesian approach is more demanding than classical null hypothesis testing approach in the pre-estimation phase, as specific assumptions regarding the likelihood function and the prior distribution are required. Yet, this investment pays off since the posterior distribution permits inferences that are more fine-grained. For the coefficients, we assume a normally distributed *prior* with a mean of zero for all coefficients. Such a prior specification implies that the model has *no* explanatory power at all. This ensures that any evidence for the validity of one particular effect is *not* induced by the specification of the prior. When collinearity is present in the data, which is likely because of the strong correlation between family management and family ownership, the posterior distributions of the effects of our variables may be sensitive to changes in the prior distributions. To overcome this potential problem, we varied the mean of our prior distributions from -0.5 to 0.5 and analyzed the sensitivity on the posterior distributions to the choice of the priors (see Table A2 for the sensitivity analysis). Since we have panel data, we also need to account for individual firm effects. For the prior distribution of the individual effects, we choose either a uniform distribution or a normal distribution. For the coefficients' respective *likelihood functions*, we assume normal distributions with parameters derived from our econometric model.

In most cases, the posterior distribution is multidimensional, i.e. it encompasses several parameters. However, we are interested in the specific distribution of the two parameters of family management and family ownership. These specific distributions cannot be deduced analytically by using methods of numerical integration. To this end, a simulation approach is used. A computer generates simulated samples from the required distribution. We apply Markov Chain Monte Carlo Techniques (MCMC) and a Gibbs Sampler to arrive at the corresponding univariate

distributions of the coefficients.[5] For the estimation and the simulation, we use a Matlab™ code, which takes 11,000 draws from the (joint) posterior distribution.[6] As usual, the first 1,000 draws are discarded.[7]

5. Regression Results

5.1 Replication of Earlier Work

Our data differ from some recent studies on family firm performance due to our use of S&P 500 firms instead of Fortune 500 or Fortune 1000 companies (c.f. Villalonga and Amit, 2006 and Miller et al., 2007, respectively). The S&P 500 index is made up of large, regularly traded public firms which reflect the overall structure of the American economy. By contrast, Fortune 500 firms are chosen only according to gross revenue. Whereas S&P 500 firms are all publicly traded, Fortune 500 firms may be privately held.

The S&P 500 (Anderson and Reeb, 2003) and Fortune 500 or 1000 samples (Miller et al., 2007; Villalonga and Amit, 2006) have been used in previous performance studies of lone founder and family firms. We chose the S&P 500 firms rather those from Fortune as these are publicly traded on a regular basis. A strong public interest in these companies of private and institutional investors makes S&P 500 companies quite transparent.

Despite these advantages, Anderson and Reeb (2003) are the only scholars with our question who chose S&P 500 firms for their analysis. Our data sample overlaps with theirs for the time period from 1994 to 1999. When taking the subsample of our firms that correspond to theirs

---

5 See Lancaster (2004, pp. 183-226) to learn more about Markov Chain Monte Carlo Techniques (MCMC) and the Gibbs Sampler.

6 The Matlab™ code is available from the authors. As an alternative, one might also use the software package WinBUGS, which is freely available from the internet website of the Medical Research Council at University of Cambridge. See http://www.mrc-bsu.cam.ac.uk/bugs (accessed January 14th, 2010).

7 The quality of the sample derived from a Markov chain improves as a function of the steps, i.e. the draws taken. See Robert and Casella (2004).

and applying similar control variables and regression analyses, we are able to replicate their main results for family firm and family CEO dummies and for the level of family ownership (the family firm definition of Anderson & Reeb (2003) encompasses lone founder firms). Results are available from the authors. In short, our data do correspond closely to those used in a well-established study, one that is most consistent in its findings with several that follow (Villalonga and Amit, 2006; Miller et al. 2007). Thus any variations in our findings using the Bayesian methodology should be due more to differences in method rather than differences in data.

5.2 Results of Bayesian Analysis

Table 3 presents the correlation matrix. As expected, correlations between the ownership and management variables are high (e.g., the correlation between the variables *ownership share of family* and *management by family* is $r=0.50$, $p<0.01$). It is difficult to separate the hypothesized management and ownership effects using classical methods. Using a Bayesian approach to estimate these effects was expected to provide further insights.

- Insert Table 3 here -

As noted, the results of Bayesian regressions are not *point estimates* but *entire distribution functions* of the effects of the independent variables included in the respective regression (the posterior distributions). Thus, Bayesian analysis allows for statements of likely and unlikely parameter values of the respective coefficient. To describe an effect, Bayesian statisticians usually report a credible interval, which is the interval which contains the parameter of interest with a certain probability. Following convention (Lancaster, 2004), we report in this paper the 90%-

credible intervals for those coefficients related to our hypotheses. If the 90%-credible interval of the particular coefficient is above 0 (below 0), we classify the effect as a *strong positive (strong negative) effect*, if the 90%-credible interval contains the 0, we classify the effect as neutral.

Table 4 and 5 show the results of our Bayesian random effects regressions. The two estimations differ in their treatment of industry effects. Table 4 displays the results of a regression in which industry effects are accounted for by using 2-digit SIC dummies; Table 5 shows the results of a regression in which industry effects are controlled for by including *mean industry performance* as a control variable. The results are quite consistent across both approaches.

- Insert Tables 4 and 5 here -

Ownership variables: the results for the ownership variables are in line with our expectations: Both a higher ownership share of family and a higher ownership share of founders exert a positive effect on financial performance. The probability that the variable *ownership by family* has a positive effect is 96% (Table 4) or 98% (Table 5). The mean coefficients are β=0.43 or β=0.44. A similar result is found for the variable *ownership by lone founder*. The probability that the variable *ownership by lone founder* exerts a positive influence is 94% (Table 4) or 78% (Table 5). The mean coefficients are β=0.44 (Table 4) and β=0.21 (Table 5). In sum, we find strong evidence for a positive effect of both family and founder ownership on performance (hypothesis 1). In three out of four cases, the 90%-credible interval was above 0.

Management variables: The results for the management variables differ to some degree from our hypothesized relationships. *Family management* seems to exert a slightly negative influence. The probability of having a positive effect is only 42% (Table 4) or 34% (Table 5). Dif-

ferent results are observed for *lone founder management*. The probability of having a positive effect is 74% (Table 4) or 58% (Table 5). In sum, our regression models indicate a neutral effect of the management variables (hypothesis 2), but more so for family than for lone founders. However, in all four cases, the zero was included in the 90%-credible interval.

Taken together, our results suggest that ownership and management are indeed two distinct dimensions of family firms exerting different influences on performance. Figures 1 to 4 display the distributions of the effects of the ownership and management variables graphically.

- Insert Figures 1 to 4 here -

Control variables: the results regarding our control variables are mostly as expected. We find strong positive effects for the variables *research intensity*, *investment intensity*, *market risk*, and *firm age*, whereas the variables *debt/equity, outside blockholders* and *total assets* seem to exert a strong negative effect on performance.

5.3 Robustness Checks

Our random-effects estimations assume that the firm-specific individual error term follows a normal distribution. To check whether our results are sensitive to this assumption, we also estimated our model with a Bayesian fixed-effects estimator.[8] The results are similar (see Table 6 and 7). The ownership variables have strong positive effects, whereas the effects of the management variables appear at best to be neutral.

[8] In classical econometrics, one would conduct of Hausman test (Hausman, 1978) which tests whether the coefficients obtained from the random-effects model deviate in a systematic way from the coefficients obtained from the fixed-effects model. A significant test-statistic indicates that the fixed-effects model should be preferred over the random-effects model.

- Insert Tables 6 and 7 here -

As a further check of the robustness of the results, we also estimated our models 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 similar results (see Table A2)

We wished to determine whether our results were robust to the generational distinctions found in earlier studies such as Anderson and Reeb (2003) and Villalonga and Amit (2006). To do so we assessed generational effects in a manner consistent with theirs by creating a first generation category that combines our family first generation firms with our lone founder firms. We then distinguished this group from later generation family firms. The results are presented in Appendix I. As in earlier studies, we found that ownership was most strongly associated with positive performance in the first generation (99% in the first generation and 80% in later generations, with much smaller median effects for later generations). That was not, however, true of management (the respective figures were 54% and 63%). Again our thematic distinction surfaced between ownership and management effects: consistent with our other findings, ownership effects were more likely to be positive than management effects, regardless of generation for both lone founder and family firms.

Finally, we shall examine whether our results hold when ownership is assumed to be endogenous to performance (Himmelberg et al., 1999; Demsetz and Villalonga, 2001). To this end, we construct an instrument using log assets, market risk, debt/equity and industry variables to predict the family and founder variables, and then we use the resulting predicted values in the Bayesian regressions (Tables 4-7). Endogenity does not change our main conclusions. The ownership variables were found to have a positive effect, whereas the management variables have a

neutral effect. This result is not surprising, since family owners and founders have been shown to be reluctant to sell their firms or abandon their managerial positions simply for performance reasons – especially during the short run (James, 2006; Landes, 2006). Thus it was unlikely that endogeneity would influence our results concerning the relationship between governance and performance. This fact has been also borne out by previous US studies of family firm performance which have used both treatment effects models and instrumental variables regressions to assess endogeneity effects (Anderson & Reeb, 2003; Villalonga & Amit, 2006; Miller et al., 2007).

6. Discussion

Reasoning from agency theory, we hypothesized that family ownership and management would show diverging effects on corporate performance. Our findings indicate that family influences are indeed Janus-faced: family ownership shows a strong positive effect whereas family management has a neutral effect. Our results suggest that the mixed findings of earlier performance studies might be explained by the particular definitions of family businesses and the way performance effects were measured.

Some studies defined family influence according to family ownership (Barth et al., 2005, Claessens et al., 2002; Faccio and Lang, 2002), others have used family management presence (Bennedsen et al., 2007; Fahlenbrach, 2006), while others still have employed both criteria (Anderson and Reeb, 2003; Villalonga and Amit, 2006). Since family ownership and management have diverging firm performance effects, the way these variables are reflected in the definition of a family business can influence performance results.

To date, two different but potentially biased approaches have been used to assess the performance effects of family ownership and management (e.g. Villalonga and Amit, 2006; Miller et al., 2007). If one examines only family ownership or family management, or conducts separate

regressions for either one, an *omitted variables bias* may occur. By contrast, if one combines both dimensions using traditional regression analyses, the effects attributed to family ownership and management may be biased as both indicators tend to be highly correlated. This problem of confounding ownership and management effects may account for the many conflicting findings among studies of family firm performance (compare Anderson and Reeb, 2003; Claessens et al., 2002; Holderness and Sheehan, 1988; Miller et al., 2007; Villalonga and Amit, 2006; Weber et al., 2003). As we have argued, classical regression techniques that rely on null hypothesis testing cannot resolve these conflicts. Our Bayesian approach, however, represents an alternative that is robust to multicollinearity (Hahn and Doh, 2006; Leamer, 1973). Thus we were able to estimate the performance effects of family management and family ownership variables in *a single* regression with unbiased predictors.

According to our results, the performance enhancing effect of family ownership is in line with positive agency expectations for family blockholders -- parties argued to have information advantages, higher incentives for management control, and lower monitoring costs (Fama and Jensen, 1983; Jensen and Meckling, 1976). Family owners have also been shown to pursue a long-term orientation and to focus on sustainable growth and profits (Miller and Le Breton-Miller, 2005). In our analyses, founder and family ownership contribute positively to firm performance. These findings significantly qualify earlier research by authors such as Anderson and Reeb (2003), Miller et al. (2007) and Villalonga and Amit (2006) who found that family-owned firms *did not* outperform other companies after the founder had left. We believe that is because this and indeed all previous research in the area confounds family ownership with the less salutary impact of family management.

As to family management, our findings suggest at best a neutral but neither clearly inferior nor superior performance effect, again challenging much of the previous research. Some studies have argued that family management adversely affects firm performance due to nepotism, cronyism, and entrenchment problems. Family managers are said to lack skills and experience and to pursue private benefits (Bloom and Van Reenen, 2007; Burkart et al., 2003; Claessens et al., 2002; Morck et al., 2005; Shleifer and Vishny, 1997; Volpin, 2002). Cucculelli and Micucci (2008) reported that family successors underperform founders in previously high performing founder firms. Perez-Gonzalez (2006) too found that family-successor led firms significantly underperformed other firms – especially if family CEOs lacked a college education. Finally, Bloom and Van Reenen (2007) showed significant underperformance of family firms but only where the eldest son became CEO "by rule". Other literature has suggested the opposite – that family managed firms may actually outperform other firms (Anderson and Reeb, 2003; Arregle et al., 2007; Miller and Le Breton-Miller, 2005; Ward, 2005; Weber, 2003). Collectively, these studies found that family managed firms either underperformed or outperformed other companies – rather dramatic conclusions perhaps motivated by the use of conventional statistical approaches. By contrast, our analysis shows a far more moderate outcome: the performance effects for family management do not reach the 90%/ 10% probability levels in Bayesian analysis – levels which would reflect an unambiguous effect on performance. The probability that family management will positively affect firm performance is only 43% or 34% (Tables 4 and 5). In other words, family management is ambiguous rather than negative (or positive) in its impact.

Our findings also inform the literature on *founder-managed* firms which again has produced mixed performance findings. Using conventional regression analysis, He (2008) reported that only founder-CEO status enhances firm performance whereas CEO ownership is detrimen-

tal. In contrast, Jayaraman et al. (2000) found no performance effect of founder-CEO status. Again, these mixed performance results may stem from multicollinearity that disguises the true effects of founder ownership and management. Our Bayesian results indicate that only lone founder *ownership* is clearly associated with higher firm performance (94% or 78% probability of a positive effect). By contrast, the effect of lone founder presence in management is less clear (74% or 58% probability of a positive effect). These more fine grained findings suggest that continued founder management does not unambiguously enhance firm performance -- a finding that neither supports nor clearly contradicts studies arguing that a firm's growth overwhelms founder expertise (Boeker and Karichalil, 2002; Wasserman, 2003; Willard et al., 1992), and with research advocating the benefits of replacing founders with outside, "professional" managers (Daily and Dalton, 1992; Flamholtz, 1990).

Our results suggest that ownership succession to family members in lone founder and family firms is not a concern. As for founders, ownership of founder descendents is likely to positively affect firm performance. However, the likelihood of a positive performance effect from a family successor in top management is much lower compared to the founder management effect. In a nutshell, founders can pass on firm ownership to their families but should consider being succeeded in leadership by professional rather than family management.

In the end, the Bayesian statistics allow us to separate the effects of ownership and management. We believe that it is more important to place probabilities on outcomes of interest than to feel obliged to assert flatly that there is a positive, negative or "null" effect. The latter assertions often give rise to interminable pro-con debates, the former simply inform decision makers about the probabilities of focal outcomes.

7. Limitations and Future Research

Our research has several limitations that suggest opportunities for future research. First, whereas our analysis clearly showed positive effects of family and founder ownership, the results for family and lone founder management variables were less definitive. Future research might benefit from the use of additional governance variables and different samples to analyze the conditions under which family and lone founder management influence firm performance. Second, research may also be warranted to study the impact of having multiple family branches and in-laws present in ownership and management. The number of family managers and lone founder managers, the positions they hold and their educational backgrounds might also be considered. Third, it will be useful to examine the strategic and organizational variables that account for and mediate between the relationships between our ownership and governance variables and firm performance. Finally, as our findings only apply to very large and publicly traded firms in the US, generalization beyond those limits may not be warranted. Additional research would be needed to replicate our results in private firms.

References

Anderson, R.C., Lee, D.S., 1997. Ownership studies: the data source does matter. Journal of Financial and Quantitative Analysis 32, 311–329.

Anderson, R.C., Reeb, D.R., 2003. Founding family ownership and firm performance: evidence from the S&P 500. The Journal of Finance 58, 1301–1328.

Arrègle, J.-L., Hitt, M., Sirmon, D., Very, P., 2007. The development of organizational social capital: attributes of family firms. Journal of Management Studies 44, 73–95.

Barth, E., Gulbrandsen, T. Schone, P., 2005. Family ownership and productivity: the role of owner-management. Journal of Corporate Finance 11, 107–127.

Bayes, T., 1763. An essay towards solving a problem in the doctrine of chances. Philosophical Transaction of the Royal Society of London 53, 370–418.

Bennedsen, M.K., Nielsen, M.K., Pérez-González, F., Wolfenzon, D., 2007. Inside the family firm: the role of families in succession decisions and performance. Quarterly Journal of Economics 122, 647–691.

Bloom, N., Van Reenen, J., 2007. Measuring and explaining management practices across firms and countries. Quarterly Journal of Economics 122, 1351–1408.

Boeker, W., Karichalil, R., 2002. Entrepreneurial transitions: factors influencing founder departure. Academy of Management Journal 45, 818–826.

Burkart, M., Panunzi, F., Shleifer, A., 2003. Family Firms. Journal of Finance 58, 2167–2202.

Chung, K.H., Pruitt, S.W., 1994. A simple approximation of Tobin's q. Financial Management 23, 70–74.

Claessens, S., Djankov, S., Fan, J.P.H., Lang, L.H.P., 2002. Disentangling the incentive and entrenchment effects of large shareholdings. Journal of Finance 57, 2741–2771.

Cohen, J., 1994. The earth is round ($p<.05$). American Psychologist 49, 997–1003.

Coles, J.W., Hesterly, W.S., 2000. Independence of the chairman and board composition: firm choices and shareholder Value. Journal of Management 26, 195–214.

Cucculelli, M., Micucci, G., 2008. Family succession and firm performance: evidence from Italian family firms. Journal of Corporate Finance 14, 17–31.

Daily, C.M., Dalton, D.R., 1992. Financial performance of founder-managed versus professionally managed small corporations. Journal of Small Business Management 30, 25–34.

Demsetz, H., 1988. Ownership, Control, and the Firm. Blackwell, New York, USA.

Demsetz, H., Villalonga, B., 2001. Ownership structure and corporate performance. Journal of Corporate Finance 7, 209-233.

Dlugosz, J., Fahlenbrach, R., Gompers, P., Metrick A., 2006. Large blocks of stock: prevalence, size and measurement. Journal of Corporate Finance 12, 594–618.

Faccio, M., Lang, L.H.P., Young, L., 2001. Dividends and expropriation. American Economic Review 91, 54–78.

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

Fahlenbrach, R., 2009. Founder-CEOs, investment decisions, and stock market performance. Journal of Financial and Quantitative Analysis 44, 439–466.

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

Fama, E.F., Jensen, M.C., 1983. Agency problems and residual claims. Journal of Law & Economics 26, 301–325.

Flamholtz, E.G., 1990. Growing Pains: How to Make the Transition from an Entrepreneurship to a Professionally Managed Firm. (Revised ed.), Jossey-Bass, San Francisco, USA.

Goodman, S.N., 2005. Introduction to Bayesian methods I: measuring the strength of evidence. Clinical Trials 2, 282–290.

Hall, B.H., 1993. The stock market's valuation of research and development during the 1980's. American Economic Review 83, 259–264.

Hall, B.H., Oriani, R., 2006. Does the market value R&D investment by European firms? Evidence from a panel of manufacturing firms in France, Germany, and Italy. International Journal of Industrial Organization 24, 971–993.

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

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

Hausman, J.A., 1978. Specification tests in econometrics. Econometrica 46, 1251–1271.

He, L., 2008. Do founders matter? A study of executive compensation, governance structure and firm performance. Journal of Business Venturing 23, 257–279.

Himmelberg, C.P., Hubbard, R.G., Palia, D., 1999. Understanding the determinants of managerial ownership and the link between ownership and performance. Journal of Financial Economics 53, 353–384.

Holderness, C.G., Sheehan, D.P., 1988. The role of majority shareholders in publicly held corporations: An exploratory analysis. Journal of Financial Economics 20, 317–346.

James, H.S., 2006. Family Sapitalism. Cambridge, Belknap-Harvard University Press, MA, USA.

Jayaraman, N., Khorana, A., Nelling, E., Covin, J., 2000. CEO founder status and firm financial performance. Strategic Management Journal 21, 1215 –1224.

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

Lancaster, T., 2004. An Introduction to Modern Bayesian Econometrics. Blackwell Publishing, Oxford, UK.

Landes, D.S. 2006. Dynasties: Fortunes and misfortunes of the world's great family businesses. New York, NY: Viking.

Leamer, E.E., 1973. Multicollinearity: a Bayesian interpretation. Review of Economics and Statistics LV, 371–380.

Levinson, H., 1971. Conflicts that plague the family business. Harvard Business Review 49, 90–98.

Martens, M.L., 2005. Hang on to those founders. Harvard Business Review 83, 19–20.

McConaughy, D.L., Walker, M., Henderson, G., Mishra, C., 1998. Founding family controlled firms. Review of Financial Economics 7, 1–19.

Mehrotra, V., Morck, R., Shim, J., Wiwattanakantang, Y., 2008. Adoptive expectations: rising son tournaments in Japanese family firms. Working Paper, University of Alberta.

Miller, D., Le Breton-Miller, I., 2005. Managing for the Long Run. Harvard Business School Press, Boston, USA.

Miller, D., Le Breton-Miller, I., Lester, R.H., Cannela, A.A., 2007. Are family firms really superior performers? Journal of Corporate Finance 13, 829–858.

Morck, R.K., Yeung, B., 2003. Agency problems in large family business groups. Entrepreneurship Theory and Practice 27, 367–382.

Morck, R.K., Wolfenzon, D., Yeung, B., 2005. Corporate governance, economic entrenchment, and growth. Journal of Economic Literature 43, 655–720.

Nelson, T., 2003. The persistence of founder influence: management, ownership, and performance effects at initial public offerings. Strategic Management Journal 24, 707–724.

Pérez-González, F., 2006. Inherited control and firm performance. American Economic Review 96, 1559–1588.

Robert, C.P., Casella, G., 2004. Monte Carlo Statistical Methods. Springer, New York, USA.

Rossi, P.E., Allenby, G.M., 2003. Bayesian statistics and marketing. Marketing Science 22, 304–328.

Shleifer, A., Vishny, R.W., 1997. A survey of corporate governance. Journal of Finance 52, 737 –783.

Schmidt, F., 1996. Statistical significance testing and cumulative knowledge in psychology. Psychological Methods 1, 115–129.

Starbuck, W.H., 2006. The Production of Knowledge. The Challenge of Social Science Research. Oxford University Press, New York, USA.

The Economist, 2006. Bayes Rules: A Once-neglected Statistical Technique May Help to Explain How the Mind Works. Print edition from Jan. 5th, 2006.

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

Volpin, P.F., 2002. Governance with poor investor protection: evidence from top executive turnover in Italy. Journal of Financial Economics 64, 61–90.

Ward, J., 2004. Perpetuating the Family Business: 50 Lessons Learned from Long Lasting, Successful Families in Business. Family Enterprise Publishers, Marietta, GA, USA.

Wasserman, N., 2003. Founder-CEO succession and the paradox of entrepreneurial success. Organization Science 14, 149–172.

Weber, J., Lavelle, L., Lowry, T., Zellner, W., Barrett, A., 2003. Family Inc., BusinessWeek #3857 (November 10) 100–114.

Willard, G.E., Krueger, D.A., Feeser, H.R., 1992. In order to grow, must the founder go: a comparison of performance between founder and non-founder managed high-growth manufacturing firms. Journal of Business Venturing 7, 181–194.

Woodworth, G.G., 2004. Biostatistics: A Bayesian Introduction. Wiley, Chicester, UK.

Table 1: Number and percent of family or founder firms by 2-digit SIC industry

SIC Code	Industry description	Non-family firm obs.	Family or founder firm obs.	Family of founder firm obs. (in %)
10	Metal mining	2	10	83%
13	Oil and gas extraction	76	18	19%
14	Mining nonmetalics, except fuels	10	0	0%
15	General building contractors	18	8	31%
16	Heavy construction, except buildings	12	0	0%
20	Food and kindred products	55	49	47%
21	Tobacco products	15	0	0%
23	Apparel and other textile products	7	28	80%
24	Lumber and wood products	17	16	49%
25	Furniture and fixtures	8	7	47%
26	Paper and allied products	45	9	17%
27	Printing and publishing	34	33	49%
28	Chemical and allied products	168	78	32%
29	Petroleum and coal products	18	10	36%
30	Rubber and miscellaneous plastic products	37	10	21%
33	Primary metal industries	31	22	42%
34	Fabricated metal products	49	5	9%
35	Industrial machinery and equipment	137	71	34%
36	Electronic and other electrical equipment	135	149	52%
37	Transportation equipment	108	6	5%
38	Instruments and related products	101	61	38%
39	Miscellaneous manufacturing products	18	10	36%
40	Railroad transportation	29	0	0%
42	Trucking and warehousing	4	0	0%
44	Water transportation	0	9	100%
45	Transportation by air	8	15	65%
48	Communications	25	46	65%
49	Electric, gas, and sanitary services	156	19	11%
50	Wholesale trade—durable goods	9	10	53%
51	Wholesale trade—nondurable goods	28	11	28%
52	Building materials and gardening	12	7	37%
53	General merchandise stores	51	26	34%
54	Food stores	33	7	18%
55	Auto dealers and service stations	7	9	56%
56	Apparel and accessory stores	6	30	83%
57	Furniture and home furnishings	16	19	54%
58	Eating and drinking places	14	8	36%
59	Miscellaneous retail	26	21	45%
60	Depository institutions	0	7	100%
61	Nondepository institutions	21	16	43%
62	Security and commodity brokers	34	20	37%
63	Insurance carriers	133	64	32%
64	Insurance agents, brokers, services	9	10	53%
67	Holding and other investment offices	3	23	88%
70	Hotels and other lodging places	0	23	100%
72	Personal services	0	10	100%
73	Business services	128	114	47%
75	Auto repair, services, and parking	10	0	0%
78	Motion pictures	3	0	0%
79	Amusement and recreation services	9	0	0%

Table 1 (continued): Number and percent of family or founder firms by 2-digit SIC industry

80	Health services	29	9	24%
87	Engineering and management services	4	10	71%
99	Nonclassifiable establishments	6	0	0%
	Total	1,915	1,143	37%

Note: a firm is classified as a founder/family firm if either a member of the family/the founder is CEO or Chaiman or the family/founder owns more than 5% of common equity.

Table 2: Description of variables

Variable	Description
Log (market-to-book value)	Calculated as market value of equity (MKVALF) + book value of total debt (DT) + convertible debt and preferred stock (DCPSTK) + current liabilities (CL) – Current Assets (CA) divided by book value of total assets (AT). Source: Compustat
Ownership by family	Percentage of shares of family (excluding lone founders). If there is no member of the founding family present as owner, the variable takes a value of zero. Sources: Company's proxy statements (mostly DEF 14A), Hoovers Handbook of American Business, and company's websites
Ownership by lone founder	Percentage of shares of a lone founder. If there is no lone founder present as owner, the variable takes a value of zero. Sources: Company's proxy statements (mostly DEF 14A), Hoovers Handbook of American Business, and company's websites.
Management by family	Dummy =1 if member of family is CEO or Chairman. Sources: Company's proxy statements (mostly DEF 14A), Hoovers Handbook of American Business, and company's websites.
Management by lone founder	Dummy =1 if lone founder is CEO or Chairman. Sources: Company's proxy statements (mostly DEF 14A), Hoovers Handbook of American Business, and company's websites.
Industry market-to-book value (mean)	Industry market-to-book value is calculated for all firms in the dataset at a 2 digit SIC. Source: Compustat
Log (R&D/assets)	R&D expenditures (XRD) divided by total assets (AT). Firms with missing data were coded=0.001. Source: Compustat
Log (Advertising/assets)	Advertising expenses (XAD) divided by total assets (AT). Firms with missing data were coded=0. Source: Compustat
Investment intensity (CAPX/PPE)	Capital expenditures (CAPX) divided by gross property, plant, and equipment (PPEGT). Firms with missing data were coded=0. Source: Compustat
Market risk	The firm's beta calculated as the firm's daily return regressed against the returns of the S&P 500 index. Source: CRSP
Debt/equity	Calculated as book value of total debt (DT) divided by market value of common equity (MKVALF). Source: Compustat.
Supershares	Dummy =1 if firm uses supershares such as dual class stock. Source: Company's proxy statements, mostly DEF 14a
Outside blockholders	Percentage of shares of outside blockholders. Source: Company's proxy statements (mostly DEF 14A)
Log (total assets)	The natural log of total assets (AT). Source: Compustat
Log (firm age)	The natural log of years since the firm was founded. Sources: firm websites, Hoovers Handbook of American Business

Table 3: Descriptive statistics and correlations

		Min.	Max	Mean	Median	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Log (market-to-book value)	-2.58	4.34	0.35	0.28														
2	Ownership by family [1]	0	0.89	0.03	0	0.06													
3	Ownership by lone founder [1]	0	0.84	0.02	0	0.15	-0.09												
4	Management by family	0	1	0.10	0	-0.05	0.50	-0.09											
5	Management by lone founder	0	1	0.20	0	0.24	-0.06	0.43	-0.17										
6	Industry market-to-book value (mean)	0.40	8.32	2.08	1.73	0.58	0.01	0.14	-0.09	0.18									
7	Log (R&D/assets)	0	0.60	0.03	0	0.39	-0.08	0.11	-0.14	0.18	0.41								
8	Log (advertising/assets)	0	0.23	0	0.01	0.14	0.09	0.01	0.01	-0.04	0.09	-0.03							
9	Investment intensity (CAPX/PPE)	0	2.59	0.12	0.1	0.43	-0.02	0.21	-0.03	0.30	0.35	0.29	0.07						
10	Market risk	-0.21	3.67	0.86	0.86	0.26	-0.05	0.22	-0.07	0.30	0.26	0.42	-0.04	0.40					
11	Debt/equity	0	36.44	0.55	0.18	-0.17	-0.06	-0.05	-0.04	-0.06	-0.13	-0.14	-0.07	-0.06	0.04				
12	Supershares	0	1	0.05	0	-0.04	0.23	0.06	0.25	-0.03	-0.01	-0.05	0.10	-0.02	-0.04	0.03			
13	Outside blockholders	0	0.99	0.14	0.12	-0.05	-0.20	-0.10	-0.15	-0.03	0.00	0.03	-0.03	-0.01	-0.01	0.00	-0.09		
14	Log (total assets)	3.61	13.83	8.64	8.48	-0.50	-0.06	-0.07	-0.01	-0.18	-0.36	-0.35	-0.10	-0.30	-0.15	0.35	0.02	-0.18	
15	Log (firm age)	0	5.41	3.90	4.16	-0.35	0.06	-0.26	0.07	-0.42	-0.29	-0.35	0.09	-0.42	-0.37	0.11	0.04	-0.11	0.38

Notes: N=3,058 obs.; all correlations with an absolute above r=0.04 have a p-value less than 0.05. The descriptive statistics refer to the variables as they are included in the econometric analysis. In particular, the logged variables are therefore difficult to interpret. The descriptive statistics referring to the non-logged variables *R&D/assets*, *advertising/assets*, *total assets*, and *firm age* can be obtained from the corresponding author.

[1] The family and lone founder ownership variables include also the observations that do not relate to family or founder firms, which is why the means of the vari ables are only 2% or 3%.

Table 4: Bayesian random-effects regression of financial performance (with industry and year dummies)
Dependent variable: Log (market-to-book value)

Independent variables	Mean coefficient	Std. dev.	Probability of Coeff. > 0	Quantiles of the posterior distribution 5th	25th	50th	75th	95th
Ownership by family	0.427	0.247	95.7%	0.019	0.258	0.429	0.595	0.830
Ownership by lone founder	0.440	0.285	94.3%	-0.020	0.246	0.436	0.632	0.912
Management by family	-0.013	0.059	41.7%	-0.110	-0.053	-0.012	0.027	0.082
Management by lone founder	0.033	0.052	73.9%	-0.053	-0.002	0.033	0.068	0.118
Log (R&D/assets)	0.033	0.023	92.6%	-0.004	0.018	0.034	0.049	0.070
Log (advertising/assets)	0.010	0.011	81.2%	-0.008	0.002	0.009	0.017	0.027
Investment intensity (CAPX/PPE)	0.964	0.095	100%	0.809	0.900	0.965	1.028	1.120
Market risk	0.111	0.023	100%	0.074	0.096	0.111	0.126	0.148
Debt/equity	-0.034	0.009	0%	-0.048	-0.040	-0.034	-0.027	-0.018
Supershares	0.188	0.123	93.3%	-0.016	0.104	0.186	0.271	0.392
Outside blockholders	-0.315	0.085	0%	-0.453	-0.372	-0.317	-0.258	-0.175
Log (total assets)	-0.203	0.022	0%	-0.239	-0.218	-0.204	-0.188	-0.167
Log (firm age)	0.232	0.092	98.8%	0.081	0.173	0.231	0.292	0.390
Industry dummies [1]			52 categories					
Year dummies [2]			9 categories					
N observations (firms)			3,058 (419)					
Observations per firm: min., mean, max.			1; 7.3; 10					

Notes: As priors for the effects of the independent variables we use normal distributions with a mean of zero and a standard deviation of one. Number of draws: 11,000 (the first 1,000 draws are discarded).

[1] reference group: SIC 28 (chemical and allied products)
[2] reference group: Year 2003

Table 5: Bayesian random-effects regression of financial performance (with industry market-to-book value)
Dependent variable: Log (market-to-book value)

Independent variables	Mean coefficient	Std. dev.	Probability of Coeff. > 0	Quantiles of the posterior distribution				
				5th	25th	50th	75th	95th
Ownership by family	0.439	0.226	97.8%	0.072	0.285	0.437	0.591	0.810
Ownership by lone founder	0.212	0.275	78.1%	-0.245	0.028	0.213	0.399	0.666
Management by family	-0.025	0.058	33.6%	-0.122	-0.064	-0.025	0.015	0.070
Management by lone founder	0.009	0.049	58.0%	-0.007	-0.023	0.010	0.042	0.091
Industry market-to-book value (mean)	0.199	0.007	100%	0.187	0.194	0.199	0.204	0.211
Log (R&D/assets)	0.050	0.021	98.9%	0.016	0.036	0.050	0.065	0.086
Log (adverstising/assets	0.016	0.010	93.9%	-0.001	0.009	0.016	0.023	0.033
Investment intensity (CAPX/PPE)	0.771	0.090	100%	0.622	0.712	0.771	0.832	0.917
Market risk	0.074	0.021	99.9%	0.040	0.060	0.074	0.088	0.108
Debt/equity	-0.042	0.009	0%	-0.057	-0.048	-0.042	-0.037	-0.028
Supershares	0.043	0.125	64.1%	-0.164	-0.042	0.048	0.130	0.242
Outside blockholders	-0.289	0.078	0%	-0.419	-0.342	-0.287	-0.236	-0.161
Log (total assets)	-0.143	0.019	0%	-0.174	-0.156	-0.143	-0.130	-0.112
Log (firm age)	0.294	0.086	100%	0.149	0.237	0.296	0.351	0.441
N observations (firms)			3,058 (419)					
Observations per firm: min., mean, max.			1; 7.3; 10					

Notes: As priors for the effects of the independent variables we use normal distributions with a mean of zero and a standard deviation of one. Number of draws: 11,000 (the first 1,000 draws are discarded).

Table 6: Bayesian fixed-effects regression of financial performance (with industry dummies)
Dependent variable: Log (market-to-book value)

Independent variables	Mean coefficient	Std. dev..	Probability of Coeff. > 0	Quantiles of the posterior distribution				
				5th	25th	50th	75th	95th
Ownership by family	0.446	0.167	99.7%	0.177	0.329	0.441	0.556	0.730
Ownership by lone founder	0.445	0.211	98.1%	0.092	0.303	0.448	0.593	0.783
Management by family	-0.013	0.043	38.7%	-0.084	-0.042	-0.012	0.016	0.059
Management by lone founder	0.033	0.037	81.6%	-0.026	0.008	0.032	0.057	0.095
Log (R&D/assets)	0.035	0.017	98.3%	0.008	0.024	0.035	0.046	0.063
Log (advertising/assets)	0.010	0.008	87.9%	-0.004	0.004	0.010	0.015	0.023
Investment intensity (CAPX/PPE)	0.966	0.078	100%	0.835	0.913	0.966	1.018	1.093
Market risk	0.111	0.019	100%	0.080	0.098	0.111	0.123	0.141
Debt/equity	-0.034	0.007	0%	-0.045	-0.038	-0.034	-0.029	-0.023
Supershares	0.202	0.089	98.9%	0.050	0.136	0.197	0.259	0.343
Outside blockholders	-0.315	0.066	0%	-0.421	-0.360	-0.315	-0.271	-0.208
Log (total assets)	-0.197	0.016	0%	-0.228	-0.213	-0.202	-0.192	-0.177
Log (firm age)	0.202	0.056	100%	0.138	0.205	0.243	0.279	0.324
Year dummies [1]	9 categories							
N observations (firms)	3,058 (419)							
Observations per firm: min., mean, max.	1; 7.3; 10							

Notes: As priors for the effects of the independent variables we use normal distributions with a mean of zero and a standard deviation of one. Number of draws: 11,000 (the first 1,000 draws are discarded).
[1] reference group: Year 2003

Table 7: Bayesian fixed-effects regression of financial performance (with industry market-to-book value)
Dependent variable: Log (market-to-book value)

Independent variables	Mean coefficient	Std. dev..	Probability of Coeff. > 0	Quantiles of the posterior distribution				
				5th	25th	50th	75th	95th
Ownership by family	0.445	0.161	99.7%	0.174	0.338	0.445	0.552	0.712
Ownership by lone founder	0.216	0.196	86.6%	-0.113	-0.086	0.217	0.346	0.534
Management by family	-0.024	0.040	27.9%	-0.090	-0.051	-0.024	0.004	0.042
Management by lone founder	0.010	0.035	60.6%	-0.048	-0.014	0.009	0.033	0.065
Industry market-to-book value (mean)	0.199	0.006	100%	0.190	0.196	0.199	0.203	0.209
Log (R&D/assets)	0.050	0.015	99.9%	0.025	0.040	0.050	0.060	0.074
Log (Advertising/assets)	0.017	0.007	99.0%	0.004	0.011	0.016	0.021	0.029
Investment intensity (CAPX/PPE)	0.775	0.073	100%	0.654	0.627	0.775	0.824	0.893
Market risk	0.074	0.016	100%	0.047	0.063	0.074	0.085	0.100
Debt/equity	-0.042	0.006	0%	-0.052	-0.047	-0.042	-0.038	-0.032
Supershares	0.059	0.087	74.5%	-0.081	-0.001	0.055	0.118	0.205
Outside blockholders	-0.291	0.061	0%	-0.391	-0.332	-0.291	-0.250	-0.191
Log (total assets)	-0.145	0.012	0%	-0.165	-0.153	-0.145	-0.136	-0.124
Log (firm age)	0.306	0.050	100%	0.221	0.275	0.308	0.339	0.381
N observations (firms)			3,058 (419)					
Observations per firm: min., mean, max.			1; 7.3; 10					

Notes: As priors for the effects of the independent variables we use normal distributions with a mean of zero and a standard deviation of one. Number of draws: 11,000 (the first 1,000 draws are discarded).

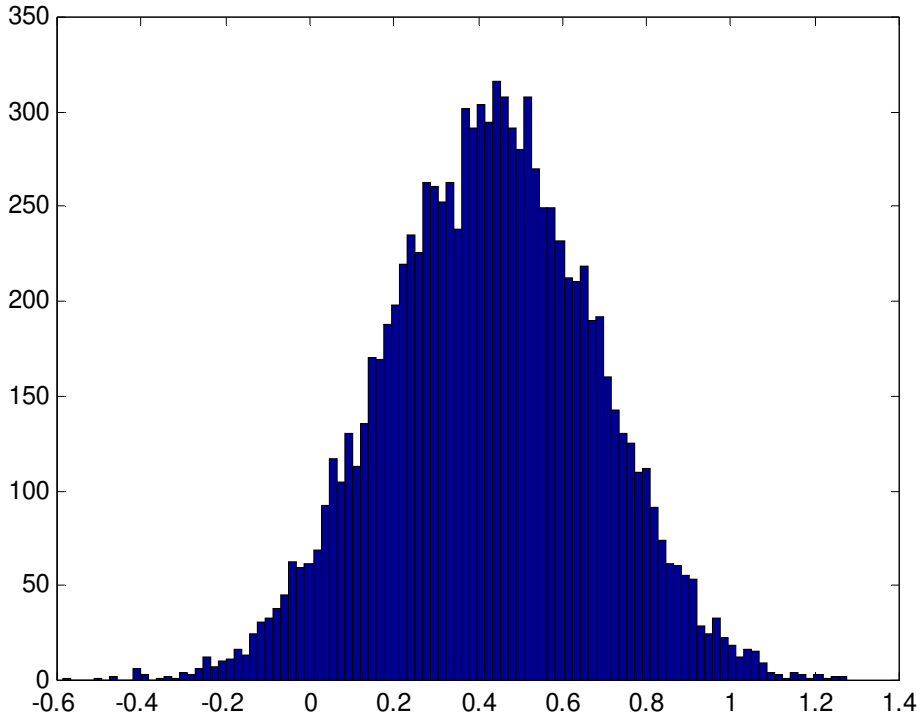

Figure 1: The performance effect of *ownership by family*

Note: The figure shows the (posterior) distribution of the variable *ownership by family*. The figure is based on the random-effects regression shown in Table 4. The probability that the variable exerts a positive effect is 96%. The median effect is ß=0.43.

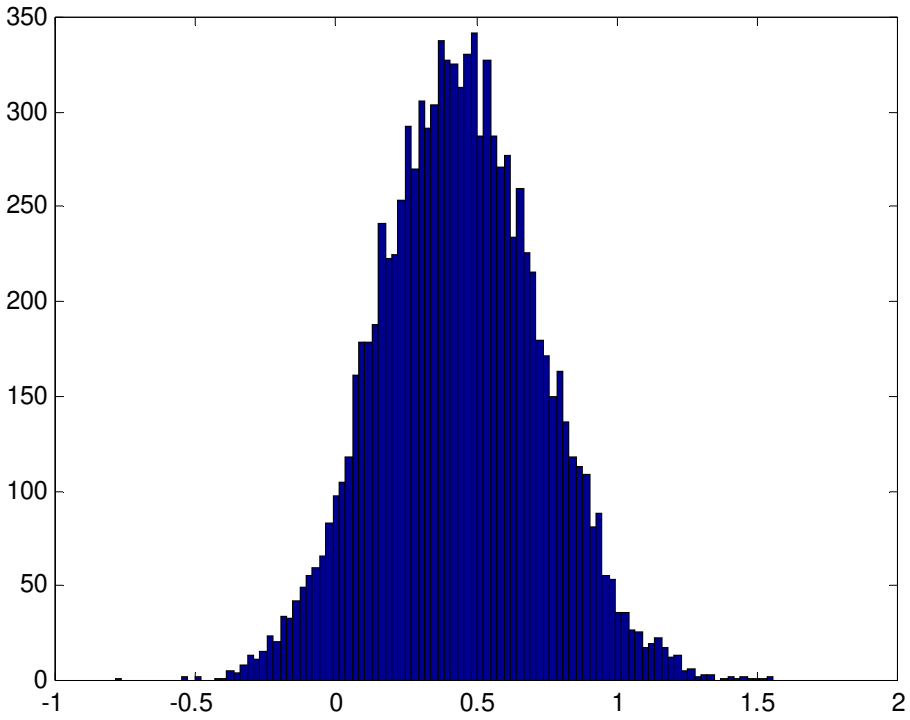

Figure 2: The performance effect of *ownership by lone founder*

Note: The figure shows the (posterior) distribution of the variable *ownership by lone founder*. The figure is based on the random-effects regression shown in Table 4. The probability that the variable exerts a positive effect is 94%. The median effect is ß=0.44.

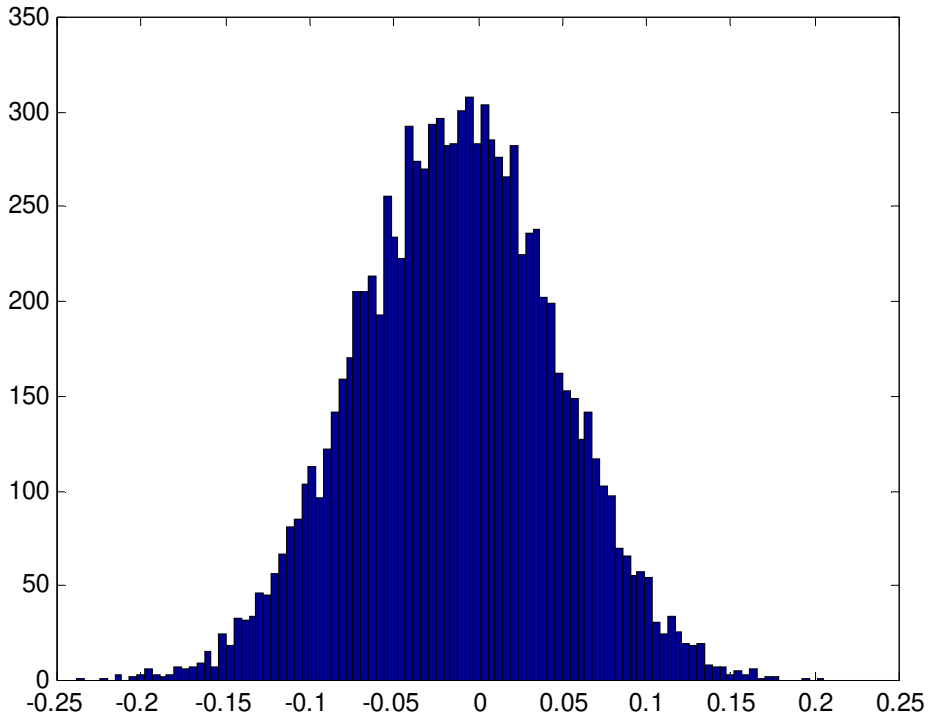

Figure 3: The performance effect of *management by family*

Note: The figure shows the (posterior) distribution of the variable *management by family*. The figure is based on the random-effects regression shown in Table 4. The probability that the variable exerts a positive effect is 42%. The median effect is ß=-0.01.

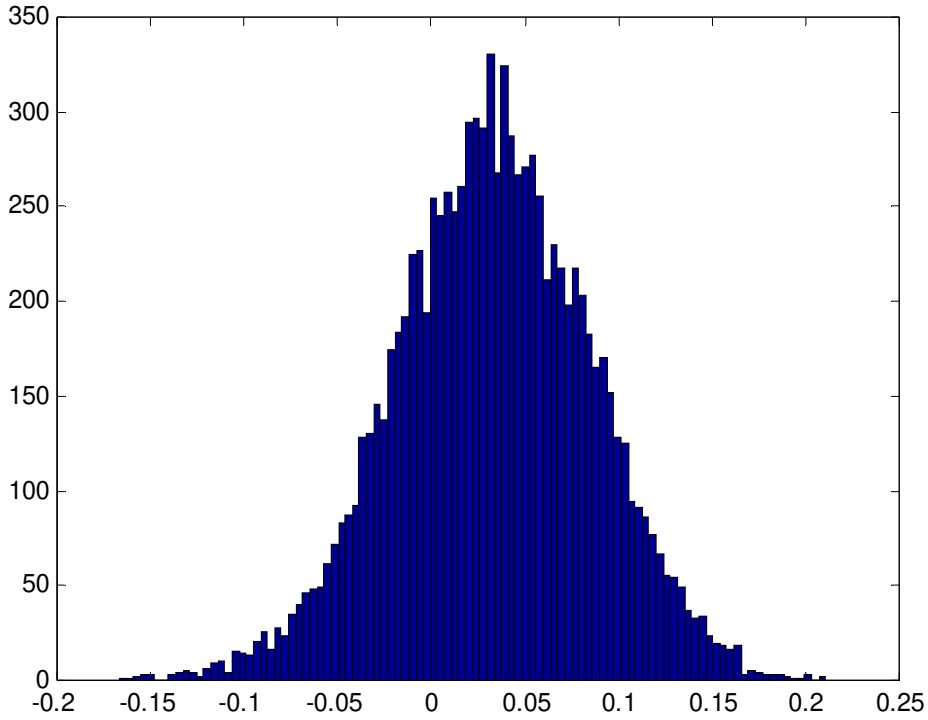

Figure 4: The performance effect of *management by lone funder*

Note: The figure shows the (posterior) distribution of the variable *management by lone founder*. The figure is based on the random-effects regression shown in Table 4. The probability that the variable exerts a positive effect is 74%. The median effect is ß=0.03.

Appendix I

Table A1: Bayesian random-effects regression of financial performance (with industry and year dummies)
Dependent variable: Log (market-to-book value)

Independent variables	Mean coefficient	Std. dev..	Probability of Coeff. > 0	Quantiles of the posterior distribution				
				5th	25th	50th	75th	95th
Ownership by family 1st generation	0.639	0.261	99.4%	0.222	0.458	0.636	0.813	1.076
Ownership by family later generation	0.237	0.282	79.8%	-0.227	0.046	0.234	0.430	0.694
Management by family 1st generation	0.006	0.053	54.5%	-0.083	-0.029	0.007	0.042	0.092
Management by family later generation	0.021	0.062	63.0%	-0.081	-0.022	0.021	0.063	0.123
Log (R&D/assets)	0.035	0.023	93.4%	-0.003	0.020	0.035	0.050	0.073
Log (advertising/assets)	0.010	0.011	79.6%	-0.009	0.002	0.009	0.016	0.026
Investment intensity (CAPX/PPE)	0.968	0.095	100%	0.812	0.903	0.968	1.032	1.125
Market risk	0.111	0.023	100%	0.073	0.095	0.111	0.126	0.148
Debt/equity	-0.034	0.009	0%	-0.049	-0.040	-0.034	-0.027	-0.019
Supershares	0.178	0.127	92.3%	-0.029	0.092	0.178	0.262	0.387
Outside blockholders	-0.318	0.084	0%	-0.456	-0.374	-0.317	-0.260	-0.179
Log (total assets)	-0.200	0.023	0%	-0.239	-0.216	-0.201	-0.185	-0.162
Log (firm age)	0.242	0.097	98.8%	0.080	0.180	0.245	0.305	0.401
Industry dummies [1]	52 categories							
Year dummies [2]	9 categories							
N observations (firms)	3,058 (419)							
Observations per firm: min., mean, max.	1; 7.3; 10							

Notes: We use normally distributed priors with a mean of zero and a standard deviation of one. Number of draws: 11,000 (the first 1,000 draws are discarded).

[1] reference group: SIC 28 (chemical and allied products)
[2] reference group: Year 2003

Table A2: Sensitivity analysis regarding choice of prior
Model: see Table 6

	Mean of prior distribution [1]										
Variables relating to hypotheses	-0.5	-0.4	-0.3	-0.2	-0.1	0	0.1	0.2	0.3	0.4	0.5
Ownership by family	93.1%	96.3%	98.0%	98.7%	99.2%	99.7%	99.7%	99.6%	99.6%	99.6%	99.7%
Ownership by lone founder	86.4%	92.0%	95.3%	97.0%	97.9%	98.1%	97.7%	97.7%	97.9%	98.2%	98.6%
Management by family	34.7%	35.5%	35.9%	36.1%	35.9%	38.7%	39.0%	40.0%	41.7%	43.8%	45.8%
Management by lone founder	84.1%	84.2%	84.0%	83.6%	82.8%	81.6%	82.3%	82.9%	83.4%	83.6%	84.1%

Notes: The cells display the probability that the effect is positive (i.e., the probability of coeff. > 0); control variables of the regressions as in Table 6.

[1] The prior distribution is a normal distribution with mean as specified in the columns and variance of one. We use the same prior distribution for all variables in the regression model.