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An Empirical Study of Norwegian Family Firms:

Leverage and Survivability

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An Empirical Study of Norwegian Family Firms: Leverage and Survivability

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Abstract

This master thesis is structured as an empirical research paper on traditional Norwegian family firms, which we define as a firm where the controlling family owns at least $\frac{2}{3}$ of the shares. This paper is concerned with the capital structure and survivability of start-up family firms. We investigated whether family firms prefer a more conservative capital structure than non-family firms and whether family ownership is associated with higher probability of survival. We found evidence that family firms have less debt-financing and higher probability of survival after controlling for relevant factors. We show that our results are robust across definitions and time, and are not affected by endogeneity issues caused by self-selection bias. We conclude that the owners of family firms are more conservative in their decision making and that these characteristics can reduce agency conflicts between shareholders and creditors. Ownership structure can be an important input in credit evaluation and debt valuation models of start-up firms' financing. Hence, this has interesting practical implications for investors in times where peer-to-peer lending is a growing industry and the first lending platforms are launching in Norway.

This thesis is a part of the MSc programme at BI Norwegian Business School. The school takes no responsibility for the methods used, results found and conclusions drawn.

Contents

1 An Introduction: Theory and Literature Review

In this paper we investigate characteristics of Norwegian family firms and their effect on the agency conflict between shareholders and debtholders. The characteristics we investigate are leverage and survivability. Excessive debt-financing and decreased probability of survival will cause conflicts of interests between shareholders and debtholders, and we want to investigate whether family firms reduce these conflicts. Family firms are an interesting field of research due to their distinction from other companies. However, depending on definitions, few family firms are listed on a stock exchange. Most corporate governance and corporate finance literature have focused on listed firms and there is little existing literature on private firms in general, due to lack of available data. However, the Centre for Corporate Governance Research (CCGR) at BI provides detailed data which makes research of private Norwegian firms feasible.

There is no universally accepted definition of family firms and many different definitions are used in the literature, ranging from having a (family) blockholder with at least $\frac{1}{20}$ of the voting rights to $\frac{2}{3}$ of the voting rights. A widely used definition of family firms on U.S. data is "...a firm in which the founders or descendants of the founding family continue to hold positions in the top management, serve on the board, or are blockholders", where blockholder is defined as more than $\frac{1}{20}$ ownership (Cheng, 2014). Berzins and Bøhren (2013) look at Norwegian firms using the CCGR database and define a family firm as a firm where a family owns more than $\frac{1}{2}$ of the shares. They find that by this definition, as of 2011, 65% of Norwegian firms are family firms and only 9 of the 71 930 family firms are listed. By changing the definition of family firms to more than $\frac{2}{3}$ ownership, 59% of Norwegian firms are family firms in 2011. As family firms in Norway make up a significant part of the economy, we find this to be an interesting topic for our thesis.

In this paper we used $\frac{2}{3}$, or more, ownership threshold to define a family firm, although we investigate how our results change when we change the definition of what constitutes a family firm. There are mainly two reasons for choosing this definition. Firstly, we want to look at what we define as a *traditional family firm*, where the family has super-majority and have absolute control according to Norwegian law, allowing the family to change the articles of incorporation (Aksjeloven § 5-18). In these firms we expect the owners and their close relatives to be more heavily involved as owners, in management and even as employees (Bøhren, Stacescu, Almli, & Søndergaard, 2018). Secondly, because of our methodology and dataset, a less restrictive definition of family firm would potentially lead us to include firms which is merely a limited liability partnership between a handful of people, and not a family firm in the true meaning of the word. The intention of this paper is to investigate how traditional family firms differ from non-family firms with respect to characteristics and how they affect the agency conflict between shareholders and debtholders. We believe this has practical implications for parties who interact with these firms.

Agency- and trade-off-theory present us with a framework to understand why family firms have different characteristics than non-family firms. Jensen and Meckling (1976) presented the idea that a firm consists of a group of securityholders with different interests, rather than looking at the firm as a single utility maximizing agent. The different interests create conflicts and materialize as agency costs. The theoretical starting point will be that the owners of family firms will choose the ownership structure and financing structure that creates the optimal value for the family. In doing so, they will consider the costs and benefits that comes with different ownership and financing structures. Bøhren (2011) summarizes the different agency problems used in the literature as:

- The conflict between managers and owners (A1)
- The conflict between majority and minority shareholders (A2)
- The conflict between shareholders and debtholders (A3)
- The conflict between shareholders and other stakeholders (A4)

Given the unique features of family ownership and control, these firms face a different set of difficulties to overcome. Such features include; financially constrained, concentrated ownership, under-diversified owners, long investment horizon and reputational concerns.

A1

In family firms, owners and managers are often the same person or closely related. This makes A1-conflicts almost non-existent for family firms, as there is little separation between ownership and control (Berzins & Bøhren, 2013).

A2

High concentration of ownership can induce conflicts of interests between majority and minority shareholders. A controlling shareholder who does not hold all cash flow rights may have incentives to direct profits through related party transactions or private benefits, known as tunnelling in the literature (Johnson, La Porta, Florencio, & Shleifer, 2000). The potential for conflict is higher when the majority shareholder's stake is closer to 50% and lower when it is close to 100% (Bøhren, 2011). There is empirical/anecdotical evidence in the literature suggesting that majority shareholders do expropriate minority shareholders through tunnelling (Johnson et al., 2000) and dividend policy (Faccio, Lang, & Young, 2001). As opposed to the empirical findings from around the world, a new paper, to be published in 2018, finds evidence that majority shareholders in private Norwegian firms do not expropriate minority shareholders but use minority friendly dividend policies to avoid A2-conflicts (Berzins, Bøhren, & Stacescu, n.d.). Berzins and Bøhren (2013) argue that private non-family firms in Norway have more A2-conflicts than family firms, as the average ownership concentration is closer to 50%.

A3

Shareholders who finance their company with debt may have incentives to expropriate debtholders through underinvestment, short-termism, asset substitution and delayed liquidation (Bulow & Shoven, 1978; Jensen & Meckling, 1976; Mayers & Smith, 1987). Despite these potential sources of agency costs, which is predicted by theory to be carried by the residual claimants, others have found that family firms prefer debt to outside equity (Croci, Doukas, & Gonenc, 2011). Domenichelli (2015) argues that his findings indicate that family firms reduce conflict of interest between shareholders and creditors since family firms are mostly committed to ensure firm survival.

A4

Family owners are often assumed to be more long-term oriented and have reputational concerns. This could potentially reduce conflicts with non-financial stakeholders through trust and implicit social contracts.

This paper is mainly concerned with the financing structure and survivability of family firms, thus the agency-conflict of interest is A3.

If family firms prefer more debt than non-family firms, it may imply that loss of control due to outside financing is expensive to the controlling family. The loss of control can be more expensive than costs from agency conflicts and increased risk incurred by debt-financing. In the trade-off theory framework, the loss of control would show up as costs to equity-financing and make the benefits of debt-financing more attractive.

Under-diversified owners imply a different set of preferences, leading to less debt-financing. Wealth constraints cause deviation from the optimal portfolio construction on the efficient frontier, violating the assumption in financial theory that all unsystematic risk is eliminated by diversification. This leads to more exposure to unsystematic risk in their portfolio, resulting in the need to reduce exposure to total systematic risk and hence their preferences may deviate from that of the market as a whole, i.e. the average investor. This need for increased stability and safety may lead family firms to be more conservative financed, smaller and more profitable with less growth opportunities.

In addition to difference in capital structure there could be difference in the sources of financing. Financial constraints may lead to different sources of financing for family firms, leading to more short-term financing such as trade-credit. Another explanation could be that family firms are more relational in their nature and are able to obtain cheaper financing through their suppliers.

Owners with long-term investment horizon imply that firm survival is more essential than short-term gains. Potential explanations for this preference could be reputational concerns, which means that more than just wealth is at stake. Also, families may regard their company as intergenerational wealth and not necessary personal wealth to be consumed during the founder's life time. On the other hand, family firms may pick their managers and employees from a smaller pool, namely family and friends. This could potentially lead to less competent management and less probability of survival. Further, family firms may be more financially constrained, leading to unnecessary bankruptcy caused by the lack of available capital.

Findings

We find evidence that traditional family firms have less debt-financing and higher probability of survival, and that they are smaller and much more profitable. These characteristics are associated with conservative decision making and could potentially reduce conflicts of interest between shareholders and debtholders.

Family firms are also more short-term financed, mainly by trade-credit. Possible explanations to these characteristics are that family firms are more financially constrained on average. Another explanation could be that family firms are more relational in their nature and are able to obtain cheaper financing through their suppliers.

We show that our results are robust across definitions and time and are not affected by endogeneity issues caused by self-selection bias.

Our results indicate that dividend ratio is, both statistically and economically, associated with increased probability of survival. This is evidence in favour of both Dividend Signalling Hypothesis and the presence of debt covenants.

In this paper we suggest a new model for bankruptcy risk (survivability) in newly started private firms. We argue that family ownership is associated with reduced credit risk. Hence, our results have important practical implications for creditors who interact with what we define as traditional family firms.

2 Research Questions

In this paper we set out to answer the following research questions:

"Do family firms in Norway have a different capital structure than non-family firms?"

Hence, we will test the following null hypothesis:

"Norwegian family firms do not have different capital structure than non-family firms".

and:

"Do family firms have different probability of survival?"

Hence, we will test the following null hypothesis:

"Family ownership does not influence the probability of survival".

If family firms have less debt-financing than non-family firms and family ownership increases the firm's probability of survival, it indicates that family firms are more conservative in their decision making. We believe that conservatism can be a characteristic associated with reduced A3-conflicts. Hence, by answering our research questions, we believe we can identify characteristics that are associated with reduced A3-conflicts.

3 Methodology and Literature Review

In this section we present the methodology we used to answer our research questions. Our main model is based on the work of Frank and Goyal (2009) and were used to answer the first research question. Further, we used a Heckman two-step correction model (Heckman, 1979) to search for potential omitted variable bias from self-selection based on unobservable characteristics. We addressed the second research question using the Cox proportional hazard model (Cox, 1972).

3.1 Frank and Goyal‘s Core Factor Model

Frank and Goyal (2009) have studied publicly traded American firms over the period of 1950 to 2003 in an attempt to identify factors that have a reliable relation with market-based leverage. They connected them to the predictions of prominent capital structure theories such as trade-off theory, pecking order theory and market timing theory. They found the following:

- Firms that compete in industries with high median leverage tend to have high leverage.
- Firms that have a high market-to-book ratio tend to have low levels of leverage.
- Firms that have more tangible assets tend to have more leverage.
- Firms that have more profits tend to have less leverage.
- Larger firms (as measured by book assets) tend to have high leverage.
- When inflation is expected to be high, firms tend to have high leverage.

Frank and Goyal identified six core factors that empirically explain leverage in listed American firms. They found these factors to be quite robust and suggest using them for further studies of leverage. We used this as our starting point to see whether we found that the same factors explain leverage in our dataset. However, since we are investigating primarily private firms we do not have market values. To deal with this, we looked at firms close to their foundation date. This makes the assumption that book values and market values are equal, reasonable. They did not find evidence that financially constrained firms had any difference in capital structure, but our dataset includes many small private firms which is more likely to suffer from severe financial constraints. By including dividend ratio as a proxy, we believe we can control for this.

Frank and Goyal used lagged variables to mitigate endogeneity problems, but states that "This neither resolve the endogeneity problem nor the lack of a structural model. But at least it has the merit of ensuring that the factors are in the firm's information set" (Frank & Goyal, 2009). We did not use lagged variables as we need to assume market-to-book ratios to be 1, and this is most reasonable in the firms' starting year.

Hence, the starting point of our analysis was the following regression:

$$\begin{aligned} Leverage_t = \alpha_t &+ \beta_1 \times Median\ Industry\ Leverage_t \\ &+ \beta_2 \times Tangibility_t + \beta_3 \times Profitability_t \\ &+ \beta_4 \times Size_t + \beta_5 \times Expected\ Inflation_t \\ &+ \beta_6 \times Dividend\ Ratio_t + \beta_7 \times Family\ Firm_t + \epsilon_t \end{aligned} \tag{1}$$

where Family Firm is a dummy variable. The interpretation of the result will be based solely on the coefficient β_7.

3.2 Heckman Two-Step Correction Model

Endogeneity issues are a central concern in corporate governance and corporate finance research. Failing to consider sources of endogeneity may lead to biased estimates and false conclusions. Considering the core factor model, there is a valid argument that the conclusion will suffer from an omitted variable bias. The reason being that financial decisions are not random and that certain companies "self-select" into various groups based on unobservable or private information. It is our assessment that private unobservable information is the essence of the potential endogeneity issue in our regressions. Hence, a Heckman two-step correction model was our preferred method in search for a potential omitted variable bias, as correcting for self-selection is equivalent to testing for private information (Li & Prabhala, 2007).

To test for self-selection bias, we ran the following regression:

$$Leverage_t = \alpha_t + [\beta_1 \times X_t] + \beta_2 \times Inverse\ Mills\ ratio_t + \epsilon_t \tag{2}$$

Where $[\beta_1 \times X_t]$ is the final core factor model and the inverse Mills ratio is unobservable characteristics that affect financing decisions. We estimated the inverse Mills ratio using variables from the core factor model on the selection dependent variable, i.e. the family dummy variable. A significant coefficient for the inverse Mills ratio would indicate self-selection bias in the data sample.

3.3 Cox Proportional Hazard Model

To see if family firms are more likely to survive, after controlling for relevant factors, we estimated the effect of family ownership on the probability of survival using Cox proportional hazard model with time-varying covariates (Allison, 2004; Cox, 1972).

We created a dataset where we limited our research interval to five years. That is, companies that survive for more than five years after the foundation date is right censored. We avoid left censoring by including companies from their foundation date, i.e. by flow sampling. The Cox proportional hazard model can only deal with time-invariant variables. To work around this limitation, the dataset must be modified appropriately. Our method of choice was to create a dataset with several observations per firm, i.e. episode splitting (Matter, 2012). Then, we used the pre-programmed feature in STATA.

The Cox proportional hazard model, unlike parametric proportional hazards models, does not need any assumption on the baseline hazard (Cox, 1972). However, it is less efficient as it uses less information for estimation. Our dataset is quite large, with 43 173 different firms totalling 134 661 observations, so the results should be conclusive. We also believe that estimation using time-variate covariates is essential as all the relevant factors vary significantly across time during the first five years of a company's existence. Hence, it is our assessment that this method is sufficient to answer our research question. The interpretation of the result will be based on the estimated hazard-ratio for the family firm dummy variable.

4 Data, Variables and Univariate Analysis

4.1 Data

Our main source of data was the Centre for Corporate Governance Research (CCGR) database, which covers Norwegian firms in the period 2000 - 2015. All single year variables in the core factor model will be from the firm's first year of existence. In the survival analysis we will only use data from the period 2000-2010 to ensure that we have five years of data for all firms. We also used SSB (SSB, 2018b) to get data on inflation.

We applied the following filters:

Filter	Description
1.	Data only includes limited liability firms (AS/ASA)
2.	Firms are independent
3.	Using data from the firm's starting year
4.	Firms must have data on ultimate ownership
5.	Firms must have had economic activity (sales)
6.	Firms accounting number must be consistent:
	- No negative sales
	- No negative depreciation
	- No negative assets (current, fixed and tangible)
	- No negative debt (bonds, long/short-term debt and trade-credit)
	- No negative dividends
7.	Removed companies with less total assets than the required
	equity in the given year:
	- 100 000 NOK in 2000-2011
	- 30 000 NOK in 2012-2015

The first filter excludes sole proprietorship which would all be defined as a family firm according to our definition.
The second filter ensures that we don't use a company twice, once as a single firm, and second as a part of a holding company's consolidated statement.
The third filter is an attempt to evade omitted variable bias from the fact that we cannot get market-to-book ratios for all firms. Instead, we used data from the firm's first year, where we assume the market-to-book ratios to be 1 and equal for all firms.
The fourth filter ensures that we can distinguish a family firm from a non-family firm.
The fifth filter eliminates companies with zero sales for their whole existence.
The sixth filter removes companies with inconsistent accounting numbers.
Seventh filter gives our models better fit, but does not change the conclusion.

4.2 Variables

Family Firm

The Family variable is a dummy variable which is 1 if the firm is defined as a family firm and 0 otherwise. We used different thresholds to define family firms:

- 100% ultimate ownership, i.e. no minority interest
- At least $\frac{2}{3}$ ultimate ownership by controlling family
- At least $\frac{1}{2}$ ultimate ownership by controlling family
- At least $\frac{1}{5}$ ultimate ownership by controlling family

Our main analysis and conclusions are based on the $\frac{2}{3}$ threshold definition. The other definitions are mainly used for robustness checking and to see where family firm characteristics change. The reason we focused on $\frac{2}{3}$ threshold is because this super-majority gives de facto control according to Norwegian law, allowing for changes in the articles of incorporation (Aksjeloven § 5-18), i.e. a "traditional family firm".
We used 100% ultimate ownership to see whether minority interests seem to matter. $\frac{1}{2}$ threshold was used to see if there was a difference between a majority and a super-majority. Finally, $\frac{1}{5}$ threshold was used, as this is a widely used definition in the literature (La Porta, Lopez-de-Silanes, & Shleifer, 1999).

Leverage

We used several definitions for leverage. All values are book values because we look mostly at private firms. Hence, no market values exist.

- Financing Leverage / Financial Institution Leverage:
  - Financing debt (Item 93 + Item 94 + Item 101 + Item 102) divided by total assets (Item 63 + Item 78)
- Total Leverage
  - Total assets (Item 63 + Item 78) minus equity (Item 87) divided by total assets (Item 63 + Item 78)

- Short-Term Debt Ratio:
  - Short-term liabilities to financial institutions (Item 101) plus accounts payable (Item 102) divided by financing debt (Item 93 + Item 94 + Item 101 + Item 102)
- Trade-Credit Debt Ratio:
  - Accounts payable (Item 102) divided by financing debt (Item 93 + Item 94 + Item 101 + Item 102)

Both Short-Term Debt Ratio and Trade-Credit Debt Ratio is equal to 1 if financing debt is 0. A high ratio is associated with financially constrained firms. By setting the value to 1 when a firm has no financing debt, we implicitly assume that the firm is very financially constrained. Without this assumption, we would lose many observations, as many firms in our dataset has no outside debt-financing.

Our main analysis is concentrated on Financing Leverage as this is supplied by external financiers and is an active choice by management. Hence, this source of financing gives rise to A3-conflicts. As a result of our methodology, i.e. we look at firms in their starting year, a large fraction of their total debt is tax payable and accrued accounting losses, and this will distort the results. This differs from Frank and Goyal's definition of leverage, which is total debt to market values of assets. However, Total Leverage is included in our analysis for robustness checking, but our analysis is limited to book values.

Median Industry Leverage

We used book values of Financing Leverage from our dataset to calculate Median Industry Leverage. Firms used to calculate Median Industry Leverage where all older than five years old. As a result, no firm observations in our analysis where used to calculate industry leverage. The reason for this is that we did not want the firms we analysed to influence the median industry leverage since we used it as an independent variable in our regressions. All companies used in the calculation had positive total assets and positive leverage ratio.

SSB's definitions of industries are used and changes in industry codes from 2009 are accounted for (SSB, 2018a). Firms with SSB industry code definition "T" and "O" where left out because of very few observations and thus unreliable median industry leverage estimates.

The calculations were done for each industry every year in the 15-year period to account for differences in leverage across industries and time.

Tangibility

We used the ratio of total fixed tangible assets (Item 51) divided by total assets (Item 63 + Item 78) as a measure for a firm's tangibility.

Profitability

We used several profitability measures:

- EBITDA (Item 19 - Item 15) divided by total assets (Item 63 + Item 78)
- Net income (Item 39) divided by total assets (Item 63 + Item 78)
- EBITDA (Item 19 - Item 15) divided by sales (Item 9)
- Sales (Item 9) divided by total assets (Item 63 + Item 78)

Expected Inflation

We used next year's actual CPI as reported by SSB as proxy for expected inflation.

Firm Size

We used the natural logarithm of total assets (Item 63 + Item 78) inflated using the CPI to year 2015 NOK as a variable to measure firm size.

Dividend Ratio

Dividend Ratio is defined as dividends (Item 105) divided by total assets (Item 63 + Item 78).

Working Capital Ratio

Working Capital Ratio is defined as inventory (Item 63) plus accounts receivable (Item 65) plus cash and cash equivalents (Item 76) minus short-term liabilities to financial institutions (Item 101) minus accounts payable (Item 102) minus tax payable (Item 103), all divided by total assets (Item 63 + Item 78).

4.3 Univariate Analysis

The following table presents descriptive statistics.

Table 1: Family and non-Family firms in the first year of existence

	Family		Non-Family		All Firms	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
Family	-	-	-	-	65.43%	-
Family w/o Minority	-	-	-	-	60.56%	-
Financing Leverage***	24.20%	33.40%	32.52%	41.54%	27.08%	36.63%
Total Leverage***	76.60%	55.37%	79.97%	62.68%	77.77%	58.02%
Short-Term Debt Ratio***	85.72%	31.32%	82.61%	33.94%	84.65%	32.28%
Trade-Credit Debt Ratio***	82.96%	33.50%	78.37%	36.54%	81.37%	34.65%
Median Industry Leverage	13.07%	9.67%	14.10%	9.88%	13.42%	9.76%
Total Assets In 2015 MNOK***	1.623	19.597	2.547	12.310	1.942	17.431
Tangibility**	18.91%	26.55%	21.06%	28.80%	19.66%	27.37%
Dividend Ratio	1.45%	6.72%	1.21%	6.08%	1.37%	6.51%
EBITDA to Total Assets***	9.80%	62.88%	-5.16%	76.50%	4.63%	68.27%
Asset Turnover Rate***	1.99	2.37	1.78	2.83	1.92	2.54
EBITDA-Margin***	0.1%	688%	-75.4%	1869%	-25.4%	1221%
Net Income to Total Assets***	2.31%	59.51%	-10.32%	74.78%	-2.06%	65.47%

Result from t-test for difference in mean between family and non-family firms:

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Variable description: Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise. Family w/o Minority is a dummy variable that is equal to one if the controlling family owns all the shares outstanding and zero otherwise. Financing Leverage is defined as financing debt, that is trade-credit plus total liabilities to financial institutions plus bonds, divided by total assets. Total Leverage is defined as total assets minus equity divided by total assets. Short-Term Debt Ratio is defined as trade-credit plus short term liabilities to financial institutions divided by total financing debt. Trade-Credit Debt Ratio is defined as trade-credit divided by total financing debt. Both Short-Term Debt Ratio and Trade-Credit Debt Ratio is equal to one if financing debt is zero. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Tangibility is defined as tangible assets divided by total assets. Dividend Ratio is defined as dividend payable divided by total assets. EBITDA to Total Assets is defined as operating income plus depreciation divided by total assets. Asset Turnover Rate is defined as sales divided by total assets. EBITDA-Margin is defined as operating income plus depreciation divided by sales. Summary statistics is after all applied filters and total number of observation is 54 786.

In our dataset, 65% of the firms are defined as family firms by the $\frac{2}{3}$ threshold. As shown, most of these firms have no minority interests. Family firms are statistically significantly smaller, more profitable and less debt-financed than non-family firms on average. This could indicate that family firms are more conservative in their decision making.

However, they possess statistically significantly less tangible assets and have more short-term financing, mainly from trade-credit, than non-family firms before controlling for relevant factors. This indicate that family firms are more financially constrained and could have more difficulties obtaining external debt-financing as they have less collateral, which is consistent with our finding that family firms have significantly less debt-financing. Evidently, profit numbers in the starting year are extreme. Anyhow, it is interesting that family firms seem to be more profitable, by any measure of profitability, than non-family firms.

5 Multivariate Analysis: Leverage and Survivability

In this section we present our main analysis and the results we used to answer our research questions.

5.1 Main Analysis: Core Factor Model

As mention in the methodology section, the following regression was our starting point:

$$\begin{aligned} Leverage_t = \alpha_t &+ \beta_1 \times Median\ Industry\ Leverage_t \\ &+ \beta_2 \times Tangibility_t + \beta_3 \times Profitability_t \\ &+ \beta_4 \times Size_t + \beta_5 \times Expected\ Inflation_t \\ &+ \beta_6 \times Dividend\ Ratio_t + \beta_7 \times Family\ Firm_t + \epsilon_t \end{aligned} \tag{1}$$

We ran the regression using multiple definitions for the dependent variable and the independent variables. See the next section for additional analysis and robustness checking.

Table 2: Core Factor Model Regressions Using OLS with Robust Standard Errors

Dependent Variable: Financing Leverage			
	(1)	(2)	$(3)^F$
Median Industry Leverage	0.589***	0.581***	0.579***
	(28.44)	(30.14)	(30.45)
Tangibility	0.199***	0.195***	0.195***
	(27.37)	(28.75)	(28.81)
Profitability	-0.254***	-0.252***	-0.251***
	(-10.75)	(-10.49)	(-10.32)
Firm Size	0.0688***	0.0694***	0.0687***
	(27.28)	(28.88)	(27.35)
Expected Inflation	0.766***	0.719***	0.722***
	(5.75)	(5.30)	(5.33)
Dividend Ratio		-0.13***	-0.129***
		(-3.80)	(-3.79)
Family			-0.0193***
			(-4.46)
Intercept	-0.776***	-0.779***	-0.757***
	(-25.69)	(-26.36)	(-22.91)
F-statistics	2250	2510	2218
R^2	0.3381	0.3386	0.3393

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

^{F}= Where (3) is the final model

Number of Observations = 54 786

Notes: Regression (1) is the Core-factor model suggested by Frank and Goyal. Definitions for Leverage and Expected inflation differs somewhat from Frank and Goyal's due to the nature of the dataset (see variable list for definitions). Regression (2) is the Core-factor model including a proxy for financial constraints (Dividend Ratio). Regression (3) is our final regression including the family dummy variable.

Variable description: Financing Leverage is defined as financing debt, that is trade-credit plus total liabilities to financial institutions plus bonds, divided by total assets. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets. Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise.

We found strong evidence that the core factor model explains financing leverage in our dataset, see regression (1) from Table 2. Our extension of the framework is statistically significant for all coefficient on the 1% level, see regression (2) and (3). The signs of the coefficients are also the same as Frank and Goyal's findings. We find our proxy for financial constraints (Dividend Ratio) to be statistically significantly associated with less financing leverage. This differs from Frank and Goyal's finding, where financial constraints did not explain leverage. This is also as expected, as our dataset consists of small private enterprises, as opposed to large public firms in Frank and Goyal's dataset.

Most interestingly, we find family firms to be statistically significantly associated with less financing leverage after controlling for relevant factors.

5.2 Additional Analysis and Robustness Testing of Core Factor Model

In this section, we show that our main results are quite robust across time, definitions and samples where our assumption that the market-to-book ratio is equal to 1 is not likely to hold, i.e. for older firms. This section also brings additional interesting insights to our analysis.

- First, we present our findings when using different definitions of leverage. We used total leverage, short-term debt ratio and trade-credit debt ratio
- Second, we present our findings when we used different thresholds for defining a family firm. We used 100% ownership, i.e. no minority interest, more than $\frac{1}{2}$ ownership and more than $\frac{1}{5}$ ownership, for the controlling family
- Third, we present test results on a different sample to confirm our main results. We used a dataset where firms are ten years old to see whether our results still hold
- Finally, we summarize the findings from this section

The results are robust across sub-samples of different time periods. We ran regression (3) from Table 2 on all five-year time intervals in the period from 2000-2015, a total of 12 regressions. The family variable coefficient is statistically significant at the 5% level in all but one sub-sample and it is always negative (See appendix A).

Different Definitions of Leverage

When we use Total Leverage as the dependent variable, our model is also statistically significant (see Table 3 on page 20). However, we find that family firms have significantly higher total leverage than non-family firms. This indicates that family firms, even though they have less financing leverage, have more non-external liabilities such as private loans and tax payable.

When we use Short-Term Debt Ratio as the dependent variable, our model is also statistically significant (see Table 4 on page 21). From the regression we find that family firms have a higher short-term debt ratio on average, but the result is only significant at the 10% level.

When we use Trade-Credit Debt Ratio as the dependent variable, our model is also statistically significant (see Table 5 on page 22). From the regression we find that family firms have significantly higher Trade-Credit Debt Ratio than non-family firms. Trade-credit seems to be an important source of financing for all firms in our dataset, the average ratio being 81,37%, but even more so for family firms (see Table 1 on page 13).

Different Thresholds for Defining a Family Firm

Results do not differ from our main model when we look at family firms with no minority shareholders (see regression (1) in Table 6 on page 23). However, when we include firms with less concentrated family ownership we see very interesting results. At the $\frac{1}{2}$ threshold, family firms do not have significantly different financing leverage than non-family firms (see regression (2) in Table 6). However, when we include firms where the family does not have a majority but only represent a major blockholder of shares, financing leverage is significantly higher (see regression (3) in Table 6).

By using Total Leverage as the dependent variable, our results show that family firms have significantly more total leverage than non-family firms across all definitions of family firms (see Table 7 on page 24).

By using Short-Term Debt Ratio as the dependent variable, we see that the positive difference in short-term debt ratio for family firms is statistically significant at the 5% level when we look at family firms with no minority interests, as opposed to using the $\frac{2}{3}$ threshold (see Table 4 on page 21 and regression (1) in Table 8 on page 25). When we look at the $\frac{1}{2}$

and $\frac{1}{5}$ threshold for family firm definition, we see a statistically significant change in the sign of the coefficient, indicating that by including firms where the family is a blockholder, family firms are financing themselves with a lower short-term debt ratio. Further, the (absolute) size of the coefficient is larger when we include firms where the family controls at least $\frac{1}{5}$ of the shares than when we use the $\frac{1}{2}$ threshold for defining family firms.

By using Trade-Credit Debt Ratio as dependent variable we get the same results as when we use Short-Term Debt Ratio (see Table 9 on page 26). When we define family firms as firms with no minority interests, we see significantly higher trade-credit debt ratio compared to non-family firms. When we extend the definitions to include having a majority stake ($\frac{1}{2}$) or beeing a significant blockholder ($\frac{1}{5}$), the trade-credit debt ratio is significantly less than for non-family firms.

Different Sample

To prove that our results are not just a coincidence caused by our assumption and dataset, we extended the analysis to include a data sample where we looked at older firms. We created a dataset where all firms are ten years old to make them comparable.

The results indicate that family firms also have less financial leverage than non-family firms in this dataset (see Table 10 on page 27). However, we want to remind the reader that our assumption that the market-to-book ratio is equal to 1 is no longer expected to hold. Hence, a potential omitted variable bias and one should not simply accept the coefficients at face value. When we use firms with the age of 30 the dataset is much smaller and the result is no longer significant. Anyhow, we believe this is enough to vindicate our results and we expect our results to be a general description of Norwegian family firms' characteristics.

Finally, the main result, i.e. that family firms have less financing leverage, is also robust if we leave out filter 7. That is, if we include firms with less total assets than the minimum required equity in limited liability companies (AS) in Norway. However, the model has a better fit, measured by R^2, and is more robust in sub-samples when we apply this filter (See appendix B).

Summary of Additional Analysis and Robustness Testing

We summarize the results by the different definitions of family firms used, i.e. 100% ownership, at least $\frac{1}{2}$ ownership and at least $\frac{1}{5}$ ownership.

- When we look at family firms without minority interest, we found family firms to have statistically significantly less financing leverage, more total leverage, higher short-term debt ratio and higher trade-credit debt ratio than non-family firms. This indicate that family firms with no minority interests are less financed by external debt and that they are more short-term financed. Also, this analysis indicates that more of their financing comes from non-external liabilities, e.g. tax payable and private loans. These findings are very similar to the $\frac{2}{3}$ threshold definition of family firms.
- When we extend the definition of family firms to include firms where the family hold at least $\frac{1}{2}$ of the shares, our results change significantly. This indicates that the marginal contribution from the new firms in the definition drives the results. This is interesting as the results shows insignificant difference in financing leverage, but they are significantly more long-term financed. This could indicate that the owners have a more long-term view, but are not necessarily more conservative, and that more dispersed ownership could lead to less financial constraints.
- When we extend the definition of family firms further, to include firms where the family holds at least $\frac{1}{5}$ of the shares, the results show that family firms have significantly more financing leverage and are even less short-term financed. This is interesting as it indicates both a long-term view and more aggressive capital structure.

Table 3: Core Factor Model Regressions Using OLS with Robust Standard Errors On Total Leverage as Dependent Variable

Dependent Variable: Total Leverage			
	(1)	(2)	(3)
Median Industry Leverage	-0.015	0.058**	0.068**
	(-0.44)	(1.96)	(2.40)
Tangibility	0.052***	0.08***	0.084***
	(5.48)	(10.18)	(10.49)
Profitability	-0.70***	-0.71***	-0.72***
	(-17.29)	(-18.12)	(-18.49)
Firm Size	0.079***	0.074***	0.077***
	(17.25)	(17.63)	(17.91)
Expected Inflation	1.40***	1.84***	1.82***
	(9.06)	(11.89)	(11.91)
Dividend Ratio		1.21***	1.21***
		(21.81)	(22.29)
Family			0.091***
			(13.44)
Intercept	-0.291***	-0.26***	-0.37***
	(-5.32)	(-5.11)	(-6.48)
F-statistics	620	548	485
R^2	0.6593	0.6769	0.6823

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Variable description: Total Leverage is defined as total assets minus equity divided by total assets. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets. Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise.

Table 4: Core Factor Model Regressions Using OLS with Robust Standard Errors On Short-Term Debt Ratio as Dependent Variable

Dependent Variable: Short-Term Debt Ratio			
	(1)	(2)	(3)
Median Industry Leverage	-0.14***	-0.13***	-0.12***
	(-10.60)	(-9.66)	(-9.63)
Tangibility	-0.463***	-0.46***	-0.46***
	(-74.26)	(-73.31)	(-73.32)
Profitability	0.016***	0.013***	0.013***
	(5.83)	(5.51)	(5.40)
Firm Size	-0.056***	-0.057***	-0.056***
	(-51.91)	(-52.85)	(-52.58)
Expected Inflation	-0.40***	-0.33**	-0.33**
	(-3.02)	(-2.47)	(-2.48)
Dividend Ratio		0.20***	0.20***
		(19.66)	(19.68)
Family			0.0044*
			(1.69)
Intercept	1.71***	1.72***	1.71***
	(123.19)	(124.26)	(121.42)
F-statistics	2553	2177	1866
R^2	0.2560	0.2576	0.2576

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Variable description: Short-Term Debt Ratio is defined as trade-credit plus short term liabilities to financial institutions divided by financing debt. Short-Term Debt Ratio is equal to one if financing debt is zero. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets. Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise.

Table 5: Core Factor Model Regressions Using OLS with Robust Standard Errors On Trade-Credit Debt Ratio as Dependent Variable

Dependent Variable: Trade-Credit Debt Ratio			
	(1)	(2)	(3)
Median Industry Leverage	-0.24***	-0.22***	-0.22***
	(-16.36)	(-15.49)	(-15.43)
Tangibility	-0.46***	-0.46***	-0.46***
	(-72.12)	(-71.30)	(-71.37)
Profitability	0.034***	0.031***	0.03***
	(6.23)	(6.07)	(5.96)
Firm Size	-0.065***	-0.066***	-0.066***
	(-52.13)	(-54.01)	(-53.34)
Expected Inflation	-0.36**	-0.28**	-0.28**
	(-2.58)	(-1.97)	(-1.99)
Dividend Ratio		0.24***	0.24***
		(17.81)	(17.91)
Family			0.013***
			(4.68)
Intercept	1.82***	1.82***	1.81***
	(114.02)	(116.30)	(111.70)
F-statistics	3018	2584	2221
R^2	0.2533	0.2552	0.2555

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Variable description: Trade-Credit Debt Ratio is defined as trade-credit divided by total financing debt. Trade-Credit Debt Ratio is equal to one if financing debt is zero. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets. Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise.

Table 6: Core Factor Model Regressions Using OLS with Robust Standard Errors On Financing Leverage with Different Tresholds

Dependent Variable: Financing Leverage			
	(1)	(2)	(3)
Median Industry Leverage	0.58***	0.58***	0.57***
	(30.64)	(29.01)	(29.02)
Tangibility	0.19***	0.195***	0.19***
	(28.85)	(28.30)	(28.35)
Profitability	-0.25***	-0.25***	-0.25***
	(-10.29)	(-10.36)	(-10.49)
Firm Size	-0.069***	0.07***	0.07***
	(27.09)	(26.52)	(28.03)
Expected Inflation	0.72***	0.72***	0.73***
	(5.34)	(5.30)	(5.41)
Dividend Ratio	-0.13***	-0.13***	-0.13***
	(-3.79)	(-3.89)	(-3.96)
Family	-0.019***	0.004	0.082***
	(-4.31)	(0.66)	(5.94)
Intercept	-0.76***	-0.79***	-0.88***
	(-22.69)	(-21.56)	(-21.76)
F-statistics	2239	2182	2151
R^2	0.3393	0.3387	0.3397

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Notes: In regression (1) the Family is a dummy variable that is equal to one if the controlling family owns all the shares outstanding and zero otherwise. In regression (2) Family is a dummy variable that is equal to one if the controlling family owns $\frac{1}{2}$ or more of the shares outstanding and zero otherwise. In regression (3) Family is a dummy variable that is equal to one if the controlling family owns $\frac{1}{5}$ or more of the shares outstanding and zero otherwise.

Variable description: Financing Leverage is defined as financing debt, that is trade-credit plus total liabilities to financial institutions plus bonds, divided by total assets. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets.

Table 7: Core Factor Model Regressions Using OLS with Robust Standard Errors On Total Leverage with Different Tresholds

Dependent Variable: Total Leverage			
	(1)	(2)	(3)
Median Industry Leverage	0.074***	0.023	0.034
	(2.65)	(0.76)	(1.14)
Tangibility	0.08***	0.08***	0.08***
	(10.66)	(9.43)	(9.66)
Profitability	-0.72***	-0.73***	-0.72***
	(-18.55)	(-18.76)	(-18.39)
Firm Size	0.078***	0.08***	0.08***
	(17.94)	(18.43)	(18.14)
Expected Inflation	1.82***	1.8***	1.89***
	(11.90)	(11.90)	(12.28)
Dividend Ratio	1.20***	1.19***	1.19***
	(22.38)	(22.54)	(22.08)
Family	0.095***	0.17***	0.29***
	(13.61)	(16.84)	(13.16)
Intercept	-0.38***	-0.51***	-0.60***
	(-6.55)	(-8.23)	(-8.84)
F-statistics	486	483	479
R^2	0.6831	0.6869	0.6821

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Notes: In regression (1) the Family is a dummy variable that is equal to one if the controlling family owns all the shares outstanding and zero otherwise. In regression (2) Family is a dummy variable that is equal to one if the controlling family owns $\frac{1}{2}$ or more of the shares outstanding and zero otherwise. In regression (3) Family is a dummy variable that is equal to one if the controlling family owns $\frac{1}{5}$ or more of the shares outstanding and zero otherwise.

Variable description: Total Leverage is defined as total assets minus equity divided by total assets. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets.

Table 8: Core Factor Model Regressions Using OLS with Robust Standard Errors On Short-Term Debt Ratio with Different Tresholds

Dependent Variable: Short-Term Debt Ratio	(1)	(2)	(3)
Median Industry Leverage	-0.12***	-0.12***	-0.12***
	(-9.60)	(-9.35)	(-9.29)
Tangibility	-0.46***	-0.46***	-0.46***
	(-73.31)	(-73.15)	(-73.20)
Profitability	0.013***	0.01***	0.014***
	(5.38)	(5.59)	(5.60)
Firm Size	-0.056***	-0.057***	-0.057***
	(-52.54)	(-52.90)	(-53.11)
Expected Inflation	-0.33**	-0.32**	-0.34**
	(-2.48)	(-2.44)	(-2.55)
Dividend Ratio	0.20***	0.20***	0.20***
	(19.68)	(19.77)	(19.80)
Family	0.005**	-0.018***	-0.056***
	(2.06)	(-5.12)	(-6.67)
Intercept	1.71***	1.74***	1.78***
	(121.57)	(118.50)	(104.32)
F-statistics	1866	1877	1876
R^2	0.2577	0.2580	0.2582

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Notes: In regression (1) the Family is a dummy variable that is equal to one if the controlling family owns all the shares outstanding and zero otherwise. In regression (2) Family is a dummy variable that is equal to one if the controlling family owns $\frac{1}{2}$ or more of the shares outstanding and zero otherwise. In regression (3) Family is a dummy variable that is equal to one if the controlling family owns $\frac{1}{5}$ or more of the shares outstanding and zero otherwise.

Variable description: Short-Term Debt Ratio is defined as trade-credit plus short term liabilities to financial institutions divided by financing debt. Short-Term Debt Ratio is equal to one if financing debt is zero. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets.

Table 9: Core Factor Model Regressions Using OLS with Robust Standard Errors On Trade-Credit Debt Ratio with Different Tresholds

Dependent Variable: Trade-Credit Debt Ratio			
	(1)	(2)	(3)
Median Industry Leverage	-0.22***	-0.22***	-0.22***
	(-15.37)	(-15.25)	(-15.08)
Tangibility	-0.46***	-0.46***	-0.46***
	(-71.37)	(-71.15)	(-71.14)
Profitability	0.03***	0.03***	0.03***
	(5.94)	(6.00)	(6.06)
Firm Size	-0.07***	-0.07***	-0.07***
	(-53.23)	(-52.89)	(-53.77)
Expected Inflation	-0.28**	-0.28*	-0.29**
	(-1.99)	(-1.95)	(-2.05)
Dividend Ratio	0.24***	0.24***	0.24***
	(17.92)	(17.90)	(17.91)
Family	0.015***	-0.01***	-0.06***
	(5.50)	(-2.63)	(-6.59)
Intercept	1.80***	1.84***	1.89***
	(111.66)	(107.12)	(96.28)
F-statistics	2224	2216	2225
R^2	0.2556	0.2553	0.2558

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Notes: In regression (1) the Family is a dummy variable that is equal to one if the controlling family owns all the shares outstanding and zero otherwise. In regression (2) Family is a dummy variable that is equal to one if the controlling family owns $\frac{1}{2}$ or more of the shares outstanding and zero otherwise. In regression (3) Family is a dummy variable that is equal to one if the controlling family owns $\frac{1}{5}$ or more of the shares outstanding and zero otherwise.

Variable description: Trade-Credit Debt Ratio is defined as trade-credit divided by financing debt. Trade-Credit Debt Ratio is equal to one if financing debt is zero. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets.

Table 10: Core Factor Model Regressions Using OLS with Robust Standard Errors On Sample Where Firm Age Equals Ten Years

	(1)	(2)	(3)	(4)
Median Industry Leverage	0.72***	0.51***	-0.05***	-0.20***
	(34.10)	(6.93)	(-3.45)	(-12.70)
Tangibility	0.35***	0.28***	-0.72***	-0.69***
	(40.81)	(10.43)	(-102.80)	(-96.93)
Profitability	-0.16***	-0.1	-0.005	0.014***
	(-3.26)	(-0.19)	(1.44)	(3.44)
Firm Size	-0.001	-0.18***	-0.04***	-0.04***
	(-0.24)	(-7.35)	(-33.09)	(-29.52)
Expected Inflation	-0.65***	0.12	0.66***	-0.68***
	(-3.20)	(0.09)	(4.36)	(4.03)
Dividend Ratio	0.43***	0.11	0.24***	-0.39***
	(-11.18)	(0.25)	(19.08)	(28.01)
Family	-0.04***	-0.08***	0.002	0.005
	(-8.34)	(-5.64)	(0.66)	(1.52)
Intercept	0.2***	3.4***	1.49***	1.44***
	(5.69)	(10.79)	(86.20)	(73.29)
F-statistics	1288	184	2502	2435
R^2	0.1307	0.0147	0.3731	0.3193

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 37 848

Notes: In this data sample we changed firm age from zero to ten years. This reduced our observations to 37 848. This dataset is completely different from the one in our main analysis due to this restriction. In regression (1) the dependent variable is Financing Leverage. In regression (2) the dependent variable is Total Leverage. In regression (3) the dependent variable is Short-Term Debt Ratio. In regression (4) the dependent variable is Trade-Credit Debt Ratio.

Variable description: Financing Leverage is defined as financing debt, that is trade-credit plus total liabilities to financial institutions plus bonds, divided by total assets. Total Leverage is defined as total assets minus equity divided by total assets. Short-Term Debt Ratio is defined as trade-credit plus short term liabilities to financial institutions divided by total financing debt. Trade-Credit Debt Ratio is defined as trade-credit divided by total financing debt. Both Short-Term Debt Ratio and Trade-Credit Debt Ratio is equal to one if financing debt is zero. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of total assets in 2015 MNOK. Total assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets. Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise.

5.3 Testing For Self-Selection Bias in Core Factor Model

Next, we checked whether self-selection on unobservable characteristics do influence capital structure, by using the Heckman two-step correction approach. This is to ensure that the validity of our results is not affected by endogeneity, i.e. omitted variable bias.

We find no evidence that self-selection on unobservable characteristics do influence financing leverage in our main model, as shown by the insignificant inverse Mills ratio coefficient in Table 11. For the other three definitions of leverage, we find a significant inverse Mills ratio, see Table 12. This is evidence of a self-selection bias in our dataset, i.e. family firms are not a random sub-sample of the population but self-select into this ownership structure based on unobservable characteristics. However, as the coefficient of the inverse Mills ratio has the same sign as the coefficient of our control variable the selection bias will understate our results.

These findings strengthen our results that family firms have less financing leverage, more total debt caused by private loans and tax liabilities and are more short-term financed, mainly by trade-credit.

Table 11: Heckman Two-Step Correction On The Main Model

(1) Dependent Variable: Financing Leverage
(2) Selection Dependent Variable: Family

	(1)	(2)
Median Industry Leverage	0.618***	-0.294***
	(37.06)	(-5.04)
Tangibility	0.182***	-0.015
	(31.66)	(-0.73)
Profitability	-0.222***	0.274***
	(-26.27)	(30.67)
Firm Size	0.0663***	-0.1081***
	(22.21)	(-23.13)
Expected Inflation	0.723***	0.466
	(4.48)	(0.79)
Dividend Ratio	-0.126***	0.011
	(-5.64)	(0.12)
Intercept	-0.75***	1.875***
	(-36.65)	(29.71)
Inverse Mills ratio (λ)	**-0.0022**	
	(-0.05)	
rho	-0.008	
sigma	0.2764	
Wald Chi^2 (df:6)	2946	

z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Notes: The inverse Mills ratio is based on the Family dummy variable as the selection dependent variable, estimated in regression (2).

Variable description: Financing Leverage is defined as financing debt, that is trade-credit plus total liabilities to financial institutions plus bonds, divided by total assets. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets. Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise.

Table 12: Heckman Two-Step Correction with Different Definitions of Leverage

	(1)	(2)	(3)
Median Industry Leverage	-0.48**	-0.13***	-0.24***
	(-2.53)	(-7.57)	(-11.60)
Tangibility	0.07	-0.44***	-0.44***
	(0.99)	(-71.98)	(-59.88)
Profitability	-0.087	0.06***	0.10***
	(-1.06)	(7.06)	(11.18)
Firm Size	-0.14***	-0.07***	-0.09***
	(-4.75)	(-22.87)	(-25.56)
Expected Inflation	2.88	-0.45***	-0.30
	(1.52)	(-2.60)	(-1.46)
Dividend Ratio	1.06***	0.16***	0.18***
	(3.94)	(6.48)	(6.01)
Intercept	0.57**	1.76***	1.87***
	(2.50)	(82.08)	(74.17)
Inverse Mills ratio (λ)	**3.71*** **	**0.21*** **	**0.37*** **
	(9.08)	**(4.76)**	**(7.86)**
rho	1.0	0.67	0.93
sigma	3.71	0.31	0.40
Wald Chi^2 (df:6)	140	8069	6037

z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 54 786

Notes: In regression (1) the dependent variable is Total Leverage. In regression (2) the dependent variable is Short-Term Debt Ratio. In regression (3) the dependent variable is Trade-Credit Debt Ratio. In all three regressions the Inverse Mills Ratio is based on the Family dummy variable as the selection dependent variable. The selection independent variables are the same as the regression independent variables. Hence, the selection regression (2) is identical to the one shown in table 11.

Variable description: Total Leverage is defined as total assets minus equity divided by total assets. Short-Term Debt Ratio is defined as trade-credit plus short term liabilities to financial institutions divided by total financing debt. Trade-Credit Debt Ratio is defined as trade-credit divided by total financing debt. Both Short-Term Debt Ratio and Trade-Credit Debt Ratio is equal to one if financing debt is zero. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of total assets in 2015 MNOK. Total assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets. Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise.

5.4 Survival Model Analysis: Cox Proportional Hazard Model

We used the variables from the original Altman's Z-score formula as the starting point to describe survivability in our dataset. The original Z-score variables are; the ratio of working capital to total assets, retained earnings to total assets, EBITDA to total assets, market value of equity to book values of liabilities and the asset turnover rate (Altman, 1968). However, because of our dataset we had to make some adjustments. We do not have data on retained earnings, so it was unfortunately left out. As mentioned, we do not have market values, so we used several book leverage ratios instead.

The hazard-ratio for Financing Leverage and Total Leverage is not statistically significantly different from 1 at any reasonable level (see regression (1) and (2) in Table 13). Hence, we find no evidence that book leverage impacts the likelihood of survival. However, we would like to remind the reader that one of our core assumptions is that the market-to-book ratio is equal to 1 in the firm's first year of existence. This assumption is less likely to hold as time goes. By the time the firm reaches five years of age the Financing Leverage and Total Leverage measured by marked values, if such values existed, could very well be different from the book values of the measures used in the model. This can explain why increased book leverage does not seem to lead to lower probability of survival. However, Short-Term Debt Ratio as the definition for leverage is statistically significant and seems to explain survivability better than the other definitions (see regression (3) in Table 13). This is interesting as the access to certain sources of financing seems to matter more than the level of debt.

The effect on survivability by the Z-score variables are, apart from Working Capital Ratio, significant but small. To improve the model, we used the insights from model (3) in Table 13, i.e. the source of financing explains probability of survival. Instead of using the Z-score values to explain survivability in our dataset, we propose to use variables that proxy for the level of financial constraint, size and profitability (see Table 14).

Table 13: Cox Proportional Hazard Model Based On Altman Z-Score Variables With Different Definitions of Leverage

	Hazard-Ratio (1)	Hazard-Ratio (2)	Hazard-Ratio (3)
Family	0.944***	0.944***	0.937***
	(-4.71)	(-4.72)	(-5.30)
Working Capital Ratio	1.000	1.000	1.000
	(0.13)	(0.39)	(-0.05)
Leverage	1.000	1.000	1.169***
	(0.12)	(1.26)	(9.42)
Profitability	0.996***	0.996***	0.996***
	(-4.53)	(-4.25)	(-4.27)
Asset Turnover Rate	1.001***	1.001***	1.001***
	(3.12)	(3.11)	(2.82)
Number of subjects	43 173	43 173	43 173
Number of of failures	28 540	28 540	28 540
Log Likelihood	-295 601	-295 600	-295 555
LR Chi^2 (df:5)	50	51	141
Number of observations	134 661	134 661	134 661

z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: In regression (1) Leverage is defined as Financing Leverage. In regression (2) Leverage is defined as Total Leverage. In regression (3) Leverage is defined as Short-Term Debt Ratio.

Variable description: Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise. Working Capital Ratio is defined as inventory plus accounts receivable plus cash and cash equivalents minus short-term liabilities to financial institutions minus accounts payable minus tax payable divided by total assets. Financing Leverage is defined as financing debt, that is trade-credit plus total liabilities to financial institutions plus bonds, divided by total assets. Total Leverage is defined as total assets minus equity divided by total assets. Short-Term Debt Ratio is defined as trade-credit plus short term liabilities to financial institutions divided by total financing debt. Short-Term Debt Ratio is equal to one if financing debt is zero. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Asset Turnover Rate is defined as sales divided by total assets.

Table 14: Cox Proportional Hazard Model with Time-Varying Covariates

	Hazard-ratio
Family	0.925***
	(-6.33)
Short-Term Debt Ratio	1.069***
	(3.35)
Profitability	0.998***
	(-2.93)
Firm Size	0.928***
	(-16.12)
Tangibility	0.945**
	(-2.46)
Dividend Ratio	0.356***
	(-10.52)
Number of subjects	43 173
Number of of failures	28 540
Log Likelihood	-295 338
LR Chi^2 (df:6)	574
Number of observations	134 661

z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Variable description: Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise. Short-Term Debt Ratio is defined as trade-credit plus short term liabilities to financial institutions divided by total financing debt. Short-Term Debt Ratio is equal to one if financing debt is zero. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Tangibility is defined as tangible assets divided by total assets. Dividend Ratio is defined as dividend payable divided by total assets.

Our survival-analysis indicates that larger, more profitable and less financially constraint firms, measured by the level of Tangibility, Dividend Ratio and Short-Term Debt Ratio, have a higher chance of survival. More interestingly, family ownership seems to increase a firm's chance of survival by 6.6-7.5 percentage points, depending on how we model survivability.

Table 15 summarizes the results of the proportional-hazards assumption test based on Schoenfeld residuals (Matter, 2012).

Table 15: Testing for Violations of Proportional-Hazard Assumption

	Prob > Chi^2
Family	0.0156
Short-Term Debt Ratio	0.3913
Profitability	0.0376
Firm Size	0.2949
Tangibility	0.6989
Dividend Ratio	0.1423
Global Test	0.0110

The proportional-hazard assumption is rejected on the 5% level for the Family- and Profitability-variable but is not rejected for the other variables. This means that the test finds evidence that the effect on survivability by Family and Profitability are not constant over time. However, we did not expect this assumption to hold in a dataset of this size, nor do we need it for the purpose of our analysis. When the proportional-hazard assumption is violated for a particular variable, it is justifiable to view the coefficient as an average effect over the period of observations (Allison, 2012).

Our results indicate that $\frac{2}{3}$ or more family ownership is associated with increased chance of a firm's survival during the first five years of a firm's existence.

6 Discussion and Conclusion

Our research brings interesting findings about Norwegian family firms. We argue that traditional family firms, defined by the $\frac{2}{3}$ ownership threshold, reduce agency conflicts between shareholders and creditors by the nature of their characteristics, namely conservative financing and higher probability of survival. Further, we suggest a new model for bankruptcy risk (survivability) in newly started private firms. We propose the following relevant factors for describing start-up success: size, profitability and level of financial constraints measured by; dividend ratio, ratio of tangible assets to total assets and short-term debt ratio.

Our finding that dividend ratio is, both statistically and economically, associated with increased probability of survival is evidence in favour of both Dividend Signalling Hypothesis and the presence of debt covenants.

We find that traditional family firms are smaller and much more profitable. Possible explanations to these characteristics are that the owners of family firms are under-diversified and prefer stability and safety through conservative financing and less growth.

We also find that traditional family firms have considerable less debt-financing and are more short-term financed, mainly by trade-credit. Possible explanations to these characteristics are that family firms are more financially constrained on average. Another explanation could be that family firms are more relational in their nature and are able to obtain cheaper financing through their suppliers.

The second part of our analysis finds strong evidence that traditional family firms have considerable higher probability of survival compared to non-family firms, even though they are smaller and more financially constrained. Possible explanations are that the owners of family firms are under-diversified, have a longer investment horizon, or both.

From the results above, we conclude that the owners of traditional family firms are more conservative in their decision making. This is evidence that they reduce agency conflicts between shareholders and creditors, such as conflicts from underinvestment and short-termism. On the other hand, a (stubborn) long-term investment horizon could lead to agency conflicts from delayed liquidation.

Our results indicate that family ownership is associated with more conservative decision making and this could reduce conflicts of interest between shareholders and debtholders. This has interesting practical implications for investors in times where peer-to-peer lending is a growing industry and the first lending platforms are showing up in Norway. Ownership structure can be an important input in credit analysis and debt valuation of start-up firms as our results indicate that family ownership is associated with reduced risk.

We show that our results are robust across definitions and time, and are not affected by endogeneity issues caused by self-selection bias. Hence, we expect our results to be a general description of Norwegian family firms' characteristics. When we use less restrictive definitions for what constitutes a family firm ($\frac{1}{5}$ ownership), we find that "family firms" are more debt-financed and are more long-term financed. This is evidence that this group may have preferences for more aggressive capital structure and is able to obtain it, as the owners may be more diversified, and a more dispersed ownership structure enables them to put up more collateral. This is consistent with earlier findings in the literature on listed firms.

The reasons for family firm's conservatism is not strictly clear from our analysis. Possible explanations to these characteristics are that the owners of family firms are under-diversified and have a longer investment horizon. An interesting extension of our analysis could be to link family portfolios and attitude towards risk to the financing decisions of their firms, to see whether under-diversified and risk-avoiding families are more conservative, and how this affects probability of survival.

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Appendices

A Appendix

Regressions 1-12 represent sub-samples of our dataset in the main model. Regression (1) is the first five-year period (2000-2004), regression (2) is the second (2001-2005) and so on.

Table 16: Core Factor Model Regressions Using OLS with Robust Standard Errors On Sub-Samples

Dependent Variable: Financing Leverage				
	(1)	(2)	(3)	(4)
Median Industry Leverage	0.73***	0.67***	0.70***	0.70***
	(20.74)	(13.93)	(20.46)	(22.04)
Tangibility	0.18***	0.16***	0.17***	0.19***
	(11.40)	(8.02)	(11.47)	(13.26)
Profitability	-0.21***	-0.19***	-0.28***	-0.29***
	(-4.08)	(-2.69)	(-4.35)	(-4.92)
Firm Size	-0.08***	0.09***	0.09***	0.09***
	(16.03)	(10.87)	(13.61)	(15.07)
Expected Inflation	-0.37	0.12	-1.27***	-1.08***
	(-1.25)	(0.61)	(-3.00)	(-2.93)
Dividend Ratio	-0.32***	-0.42***	-0.21**	-0.18*
	(-3.24)	(-3.26)	(-1.96)	(-1.92)
Family	-0.01	-0.02**	-0.03***	-0.03***
	(-0.96)	(-2.54)	(-3.78)	(-3.82)
Intercept	-0.94***	-0.99***	-0.99***	-0.99***
	(-13.07)	(-8.92)	(-11.14)	(-12.68)
F-statistics	480	306	492	580
R^2	0.3082	0.2896	0.3247	0.3303

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 17: Core Factor Model Regressions Using OLS with Robust Standard Errors On Sub-Samples

Dependent Variable: Financing Leverage				
	(5)	(6)	(7)	(8)
Median Industry Leverage	0.63***	0.65***	0.65***	0.63***
	(22.20)	(16.24)	(16.43)	(16.69)
Tangibility	0.22***	0.23***	0.23***	0.22***
	(16.51)	(13.43)	(13.81)	(13.50)
Profitability	-0.37***	-0.29***	-0.27***	-0.27***
	(-9.29)	(-3.77)	(-3.79)	(-4.04)
Firm Size	0.09***	0.08***	0.09***	0.09***
	(23.00)	(11.84)	(12.64)	(12.98)
Expected Inflation	0.5*	0.30	0.13	0.14
	(1.85)	(1.11)	(0.48)	(0.54)
Dividend Ratio	-0.02	-0.15	-0.16*	-0.15*
	(-0.30)	(-1.47)	(-1.71)	(-1.69)
Family	-0.02***	-0.03***	-0.03**	-0.03**
	(-2.69)	(-2.76)	(-2.26)	(-2.48)
Intercept	-1.1***	-0.99***	-1.0***	-1.01***
	(-20.22)	(-10.64)	(-11.40)	(-11.51)
F-statistics	560	697	642	715
R^2	0.3879	0.3933	0.3879	0.3786

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 18: Core Factor Model Regressions Using OLS with Robust Standard Errors On Sub-Samples

Dependent Variable: Financing Leverage				
	(9)	(10)	(11)	(12)
Median Industry Leverage	0.60***	0.53***	0.52***	0.53***
	(17.19)	(14.81)	(14.37)	(15.44)
Tangibility	0.21***	0.19***	0.19***	0.18***
	(13.50)	(14.73)	(16.02)	(17.19)
Profitability	-0.26***	-0.28***	-0.26***	-0.25***
	(-4.10)	(-5.78)	(-6.33)	(-7.21)
Firm Size	0.08***	0.07***	0.07***	0.07***
	(13.52)	(14.05)	(14.58)	(15.67)
Expected Inflation	0.60*	1.65***	2.55***	2.37***
	(1.76)	(4.95)	(6.98)	(7.00)
Dividend Ratio	-0.14*	-0.08	-0.09*	-0.07*
	(-1.78)	(-1.22)	(-1.65)	(-1.75)
Family	-0.02**	-0.016**	-0.017**	-0.014**
	(-2.34)	(-1.97)	(-2.32)	(-2.14)
Intercept	-0.95***	-0.88***	-0.81***	-0.75***
	(-11.74)	(-12.07)	(-12.48)	(-13.30)
F-statistics	699	710	772	684
R^2	0.3642	0.3772	0.3464	0.3314

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B Appendix

The table is on the next page.

Table 19: Core Factor Model Regressions Using OLS with Robust Standard Errors w/o Filter 7

Dependent Variable: Financing Leverage			
	(1)	(2)	(3)
Median Industry Leverage	0.612***	0.595***	0.589***
	(10.69)	(10.76)	(10.83)
Tangibility	0.203***	0.196***	0.195***
	(13.14)	(14.50)	(14.57)
Profitability	-0.167***	-0.167***	-0.167***
	(-3.42)	(-3.42)	(-3.41)
Firm Size	0.077***	0.078***	0.078***
	(4.60)	(4.78)	(4.69)
Expected Inflation	0.651**	0.563*	0.571*
	(2.11)	(1.79)	(1.82)
Dividend Ratio		-0.261***	-0.257***
		(-3.88)	(-3.85)
Family			-0.034***
			(-3.55)
Intercept	-0.897***	-0.907***	-0.873***
	(-4.08)	(-4.17)	(-3.90)
F-statistics	639	1330	1123
R^2	0.2787	0.2789	0.2791

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of Observations = 57 236

Notes: Regression (1) is the Core-factor model suggested by Frank and Goyal. Definitions for Leverage and Expected inflation differs somewhat from Frank and Goyal's due to the nature of the dataset (see variable list for definitions). Regression (2) is the Core-factor model including a proxy for financial constraints (Dividend Ratio). Regression (3) is our final regression including the family dummy variable.

Variable description: Financing Leverage is defined as financing debt, that is trade-credit plus total liabilities to financial institutions plus bonds, divided by total assets. Median Industry Leverage is calculated from the whole population excluding the companies in the analysis, i.e. for firms older than five years old. Median Industry Leverage is calculated for each of the 15 years and for each industry and changes in Industry codes in 2009 have been adjusted. Tangibility is defined as tangible assets divided by total assets. Profitability is defined as operating income plus depreciation (EBITDA) divided by total assets. Firm Size is defined as the natural logarithm of Total Assets in 2015 MNOK. Total Assets in 2015 MNOK is calculated as fixed assets plus current assets and then inflated using CPI as reported by SSB. Dividend Ratio is defined as dividend payable divided by total assets. Family is a dummy variable that is equal to one if the controlling family owns $\frac{2}{3}$ or more of the shares outstanding and zero otherwise.

C Appendix

List of Tables