SKIN IN THE GAME

SHOULD INVESTORS CARE ABOUT MANAGER AND BOARD MEMBER OWNERSHIP?

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Bachelor Thesis

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Skin in the game – should investors care about manager and board member ownership?

Abstract:

In this study, we investigate if companies where corporate insiders (board members and management teams) own a significant share of the company, have a better stock price performance than companies where corporate insiders own little or no shares. We use the Fama-French three-factor model to break down the stock price performance. The geographic scope of the study is limited to the Nordic region (Sweden, Finland, Norway, and Denmark). The results of the study show that insider-owned companies have a better stock price performance than their non-insider-owned counterparts. The monthly over-performance we find is 0.74% for insider-owned companies and 0.40% for a market-neutral portfolio consisting of long positions (buying) insider-owned companies and short positions (selling) in non-insider-owned companies. Therefore, investors should take the overperformance of insider-owned companies into account when making investment decisions.

Keywords:

Ownership Structure, Stock Price Performance, Insider Ownership, Incentives, Equity Ownership

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1. Introduction

1.1 Background

Drivers of stock-performance in firms and corporations is a widely discussed and studied concept within finance. Several researchers address, analyze and study this topic from many different angles. e.g. Banz (1980) and Fama and French (1992). Thus, they find that over- or underperformance can be explained by many different characteristics. Some studies look at the role of the board of directors and how performance increases when board members are replaced by stronger candidates (Brav, Jiang, and Partnoy, 2008). We look at this from a slightly different perspective as we focus on the role of ownership and how it affects stock price performance. Berle and Means (1932) argued for the separation of ownership and control and found that this affects motivation. They show that owners, especially in listed firms, often do not match the ones in control (i.e., the management of the companies). Therefore, the incentives can be misaligned which creates principal-agent problems. This in turn leads to issues where management act in ways that do not benefit the owners. We build upon this reasoning and delve deeper into the concept of alignment of incentives and minimization of the agency problem through equity ownership. In practical terms, we focus on the relationship between direct ownership and stock price performance. Within this field, there are several prominent studies. E.g. Morck, Shleifer and Vishny (1988), which investigates ownership of the board of directors and how this affects market valuation, (non-monotonic positive effect). Coles, Lemmon, and Meschke (2012) continue to study this topic but with more recent data and conclude that the findings of a non-monotonic relationship are accurate. They also find that incentive and compensation contracts should be designed based on this. Other studies show that family firms (that share many of the characteristics we measure) perform better compared to non-family firms, with two prominent studies being Villalonga and Amit (2006) and Anderson and Reeb (2003). Similarly, Von Lilienfeld-Toal and Ruenzi (2014) study the same concept but focused on CEO (Chief Executive Officer) ownership and conclude that firms with CEO ownership achieve a stronger stock price performance, reaching as much as 4-10% annually. They also find the most significant effects in companies with weaker external governance (e.g., boards). This is partly explained by the reduced risk of financial frictions such as empire-building that equity ownership contributes to.

1.2 Purpose of the study

We address this issue from an investor’s perspective, rather than from an operational perspective. We deem this more relevant for a larger number of participants. This is supported by the practical applicability of the study as investors themselves can use our strategy in the markets.

Furthermore, the roles of the board of directors and management are quite different. The board is appointed to govern and set strategy while management is appointed to take care of the operational work and maximize firm value. Firstly, we see these roles as both important and complementary. This leads us to believe that management is incentivized to maximize firm value when being owners of the firm. Similarly, board members should be more inclined to govern if they have significant ownership. Secondly, the roles of management and board members are not always separable. Management can serve on the board or move from a managerial role into a board of director role while still being involved in day-to-day operations. Thirdly, both management and board members can affect the firm's performance and minimize principal-agent

issues. Therefore, we study the effect that equity ownership has on the incentives of this combined group. This results in the following research question.

"Is management and board member ownership ("insider ownership") in the firm positively related to stock price performance?"

This broader definition of insider ownership covers more custodians of the firm and reduces the issue of looking at either management or board member ownership, as their roles are complementary. I.e., bad management is replaced faster with a good board (Brav, et al., 2008), and managers (with insider ownership) operating under a worse board will be less inclined to fall for financial frictions like empire-building (Berle and Means, 1932). Our analysis shows that management and board member ownership is positively related to stock price performance during 2017.01.01 – 2021.12.31. The portfolio of insider-owned companies has a 0.74% monthly overperformance and the portfolio that buys insider-owned companies and short sells non-insider owned companies (long-short portfolio) has a 0.40% monthly overperformance. This is valuable to investors as market participants can replicate the strategy outlined in this study to outperform the market. Investors can do this by going long (buying) a basket of securities in companies with a high degree of management and board member ownership and going short (selling) companies with little to no board member and management ownership. An implication of the results of the study is that shareholders should push for custodians of the firm to buy equity in the companies they represent. Another implication is that companies can choose to compensate key people with equity rather than cash. This would improve corporate governance, the operational work and create financial incentives for the custodians of the firm to further improve the company.

We believe this is the first study analyzing the effect of insider ownership by management teams and board members combined that is based on Nordic data. The reason for the lack of research can partly be explained by the lack of condensed ownership data. In some markets, this ownership data is not publicly available or disclosed. In cases where the data is disclosed, it is often unstructured and difficult to compile. This study is made possible by the data provider Holdings which has compiled and structured ownership data in the Nordic region. Despite this, the ownership data provided by Holdings needs manual adjustments. By studying the ownership of the broader management team along with members of the board in Nordic companies, we believe we fill a gap in existing research.

1.3 Research boundaries

We choose to limit our study to firms listed in the Nordic countries (Sweden, Norway, Denmark, and Finland). Further, we limit ourselves to firms that are listed on the Nasdaq main-list and the corresponding exchange in Norway (Oslo Stock Exchange / Euronext main list). Iceland is excluded due to the size of its capital markets and few listed companies. Companies listed on the First North Markets and Spotlight Stock exchange in Sweden, Oslo Axess and Merkur Market (Euronext growth) in Norway are excluded. This study examines stock price performance over a five-year period which is due to the lack of structured ownership data before 2017. Covering a longer period would be better but would mean increased complexity when collecting ownership data. Our sample consists of 749 firms and the required work of manually collecting this data is out of scope for this study. Lastly, shareholdings of employees, middle management and other executives that are involved in the operations of the firm are excluded from the study.

2. Theoretical framework and empirical studies

2.1 Previous empirical studies

2.1.1 Agency theory / principal agent theory

Berle and Means (1932) research the relationship between ownership and control in American corporations. They find that publicly traded American corporations are characterized by dispersed ownership among several small owners and that managers have de facto control of the corporations. They state that a situation where ownership does not match control creates a problem as incentives between owners and managers are unaligned. This leads to managers being able to use their control of the firms to deploy assets to benefit themselves at the expense of shareholders. Building on this research, Jensen and Meckling (1976) define the agency relationship as a contract in which a principal engages and delegates decision-making authority to the agent to perform services on the principal's behalf. As ownership and control are separated, they mean that agency problems arise as the interests of the agent and principal diverge. If a manager (agent) does not run the corporation efficiently and seeks to maximize the value of the firm, shareholders (principals) will bear the costs. However, as the manager's equity stake in the firm increases, they will bear a larger fraction of the costs. As a result, managers will squander fewer resources and run the firm more cost-efficiently to maximize their utility.

2.1.2 Management team and board members effect on market valuation

The above studies can be considered to investigate the psychological effects of equity and how equity ownership affects decision-making and incentives. Since Jensen and Meckling (1976) conclude that incentives and decisions change with equity ownership, this will result in different decisions by managers. As different decisions lead to different outcomes, this should be accompanied by a difference in performance (as decisions can be worse or better). This should eventually result in different valuations as "good" firms are and should be valued higher (Banz 1980). Morck et al. (1988) measure these differences in market valuation using Tobin's Q for different ownership levels. The study concludes that there is a relationship between them, but a non-monotonic one. Market valuation rises for low levels of ownership (up to ~5%) then decreases to levels of ~25% and then monotonically increases. However, Tobin's Q values for firms with between ~5% and ~25% board ownership is still higher than for firms with 0% (or negligible) board ownership. Further research from Coles et al. (2012) expands on the subject and models how to design compensation and incentive schemes based on ownership levels of board members.

2.1.3 Relationship between stock price performance and ownership

In line with the findings above, later studies look at the relationship between stock price performance and ownership structures. Von Lilienfeld-Toal and Ruenzi (2014) find that firms where the CEO has a significant equity stake deliver annual abnormal returns of up to 10% annually. Other studies, such as Anderson and Reeb (2003) and Cella (2009) conclude that family-owned firms perform better than non-family firms and insider-owned firms perform better

than non-insider-owned firms. We deem these studies that entirely or partly investigate stock-price performance of family firms relevant since these firms share many of the characteristics of firms covered in our study.

2.2 Hypothesis

The relationship between stock price performance and ownership is established in previous literature by Cella (2009) and Von Lilienfeld-Toal and Ruenzi (2014). These studies conclude that family firms and firms where the CEO has significant equity ownership perform better in the stock market. We argue that this phenomenon should not only apply to CEO-owned firms, but also to firms where the management team and board members have significant ownership. Our hypothesis is built on the research of Berle and Means (1932) who separate the principle of ownership and control and its effect on incentives. As more custodians of the firm (management teams and board members) acquire ownership, they all should be more incentivized and run less risk of squandering resources (Jensen and Meckling, 1976). Therefore, our null hypothesis and hypothesis are formulated as:

H_0: Management and board member ownership ("insider ownership") in the firm is negatively related to stock price performance.

H_1: Management and board member ownership ("insider ownership") in the firm is positively related to stock price performance.

3. Methodology

3.1 How to measure effect

In order to test our hypothesis, we must choose how to measure the effect of insider ownership. Previous studies, such as Demsetz and Lehn, (1985) use operational measurements like ROE (Return on Equity) to measure firms' over- and underperformance. Other studies such as Frye, (2004) and Morck et al. (1988) use Tobin's Q to evaluate market valuation. We examine the research question from the investor's perspective and a rational investor analyzes companies and is concerned with the return of their investments (Banz 1980). Furthermore, different operational measures are suited for different industries or companies. For example, measures like ROE are capital structure-dependent and equity (market capitalization) is volatile. This leads to this measure differing drastically between periods. Further, industries differ in capital intensiveness, leading to free cash flow conversion differing. Measures such as ROCE (Return on Capital Employed) are therefore not entirely accurate either even though it is capital structure neutral.

Due to this, we choose to look at stock price performance. This is supported by earlier studies also using stock prices. Examples of such studies are Cella (2009), who examines the relationship between ownership structure and stock market returns and Von Lilienfeld-Toal and Ruenzi (2014), who examine the relationship between CEO ownership and stock market performance. Finally, we approach the subject from an investor's perspective, and stock prices suit this purpose well as you can replicate the results in the financial markets.

3.2 Research design

We create portfolios with insider-owned companies and non-insider-owned companies to compare their performances. We also create a long-short portfolio which goes long the insider-owned companies and short sells the non-insider portfolio. This is an approach multiple other academics use, including Von Lilienfeld-Toal and Ruenzi (2014), and Cella (2009). Stock price performance for the portfolios is measured between 2017.01.01 – 2021.12.31.

3.2.1 Portfolio selection criteria and categorization

We define an insider-owned company as a company in which the management and the board members' collective shareholding is at least 10%. We define the management and board members as the people that the company itself considers to be part of the group's management team and board members of the parent company. This definition is aligned with the definition of our ownership data provider Holdings. We choose an absolute limit due to the non-monotonic results of Morck et al. (1988). Their results indicate that the exact level of board ownership might not be as important, but whether the company is insider-owned or not. We choose a level of 10% since it is used in other similar studies, including Cella (2009) and Von Lilienfeld-Toal and Ruenzi (2014). We define ownership as the collective equity owned divided by the current number of outstanding shares. We look at the percentage of equity rather than votes since we believe pure equity ownership is the best indicator for financial incentives.

We only include direct ownership, defined as being a physical individual holding the shares or holding the shares through a holding company. By this definition, we exclude ownership structures where a trust owns the shares and board members, or management are trustees. We also exclude ownership of options and derivatives.

3.2.2 Portfolio Construction

To conduct our analysis, we construct two separate portfolios. The companies in our dataset are divided into the insider portfolio if they fulfil the 10% insider ownership criteria and the non-insider portfolio if they do not. Equally weighted portfolios are constructed for the two datasets. A long-short portfolio is then created which goes long the insider portfolio and short the non-insider portfolio. The stock price returns of the portfolio are measured monthly. The portfolios are rebalanced at the end of each month. When we calculate the returns of the portfolios, we use the adjusted closing price which adjusts for corporate actions such as dividends, stock splits, rights offerings, and spinoffs. This is a measure to improve the comparability of stock price returns between firms throughout the period.

We use equally weighted portfolios as the dataset of companies that fulfil our ownership criteria are often small-cap companies. This is partly because it is easier for a private individual to own a larger portion of a smaller company. A smaller amount of money and a smaller portion of their net worth is needed to acquire a fraction of the firm. Relatively few large companies fulfil our insider ownership criteria. Therefore, we deem that large parts of the results of a value-weighted insider portfolio would be driven by the idiosyncratic results of a few large-cap companies. Therefore, we believe using a value-weighted index is not suitable for this study. Further, we believe the management teams and board members have more influence over smaller

firms (with fewer divisional, regional managers, etc.). Therefore, the effect of high-performing and incentivized top-management and board members should be larger in small-cap firms.

3.2.3 Fama-French three-factor model

In our regressions, we analyze the relationship between management team and board member ownership with stock price performance. According to our hypothesis, this will be a factor that affects stock prices. However, there are more drivers of stock price performance that we must account for in our regression. The Capital Asset Pricing Model (or CAPM) which is built upon the research of Markowitz (1952), Sharpe (1964), Lintner (1965), and Mossin (1966), is one model that can be used to break-down stock-performance. The model explains the relationship between the expected return for an asset and the systematic risk borne by the asset. The CAPM expressed mathematically is the following:

$$(1)\ ER_i = Rf + \beta_i(ER_m - Rf)$$

New research argues that in addition to the systematic risk borne by a stock, there are more factors and drivers of stock price movements. Building on the Capital Asset Pricing Model in equation 1, Fama and French (1992) introduced a model which breaks down stock performance into two more factors. The other two factors in the Fama-French three-factor model that explain stock price performance are market capitalization (denoted as SMB in the model) and book-to-market values (denoted as HML in the model). These two factors account for the fact that high-book-to-value and small-cap firms have historically outperformed low-book-to-value and large-cap firms, respectively. The mathematical expression of the Fama-French three-factor model is the following:

$$(2)\ R_{it} - Rf_t = \alpha_{it} + \beta_1(RM_t - Rf_t) + \beta_2 SMB_t + \beta_3 HML_t + \epsilon_{it}$$

R_{it} = *total return of a stock or portfolio i at time t*

Rf_t = *risk free rate of return at time t*

RM_t = *total market portfolio return at time t*

$R_{it} - Rf_t$ = *expected excess return*

$RM_t - Rf_t$ = *excess return on the market portfolio (index)*

SMB_t = *size premium (Small Minus Big)*

HMLt = value premium (High Minus Low)

$\beta_{1,2,3}$ = *factor coefficients*

A positive β_2 means that the portfolio performs similarly to a portfolio of small-cap stocks. A positive β_3 means that the portfolio behaves or performs similarly to a portfolio of "value-stocks" (firms with high book-to-value ratios).

There are newer models that build upon the Fama-French three-factor model such as the Fama-French Carhartt four-factor model (Carhartt, 1997) and the Fama-French five-factor model (Fama and French, 2015). The differences are that the four-factor model includes a momentum factor (MOM), and the five-factor model adds a profitability (RMW) and an investment factor (CMA). In our study, we use the three-factor model due to several reasons. Firstly, the study by Von Lilienfeld-Toal and Ruenzi (2014) uses the three-factor model. Cella (2009) also uses the three-factor model, however, she chooses to modify it to only include the market-factor (RM-Rf) and the market-capitalization factor (SMB). Lastly, and most importantly, the three-factor model is the most frequently used model to evaluate stock price performance (excluding the CAPM). This is based on statistics of number of citations from Google Scholar where the three-factor model has the greatest number of citations (24,907). This can, however, partly be explained by it being released earlier. Despite this, we deem the three-factor model as the most suitable model for our study.

4. Data

4.1 Collection of financial data

To examine our hypothesis, we collect stock price data for all the firms in the Nordic countries (Sweden, Norway, Denmark, and Finland) listed on Nasdaq exchanges or the corresponding exchange in Norway (Oslo Stock Exchange / Euronext). Iceland is excluded due to the small size of the country's capital markets and few listed companies. Companies listed on the First North Markets and Spotlight Stock exchange in Sweden, Oslo Axess and Merkur Market (Euronext growth) in Norway are excluded. These exchanges have different listing requirements, and we deem that firms listed on the main exchanges make for the best comparison across borders. Data is collected from the financial database Finbas which is available through the Swedish House of Finance. The data consists of monthly returns from 2017.01.01 – 2021.12.31. Each data point is the adjusted closing price each month. Using an adjusted closing price is necessary to account for corporate actions such as dividends, stock splits or rights offerings. Otherwise, our measure of performance would be heavily affected by capital-allocation strategies such as the distribution of dividends or share repurchases. This would affect the comparability of stock price returns negatively.

We remove data points for companies that have several share classes such as A-shares, B-shares, and preference shares. The share class that is the most liquid is included while the other share classes of the same company are removed. This is to remove duplicates in our constructed portfolio. Furthermore, we do not believe that the performance (i.e., appreciation or depreciation) of preference shares (or equivalent) is well suited to this study, and we choose to exclude these. This is because their upside is limited.

As some data sources do not adjust for spinoffs, we conduct manual checks of the data to make sure these adjustments have been done correctly. We investigate a few well-known spinoffs that take place during our time period to see that there is no drastic share price decline. A few examples of spinoffs are, the spinoff of Essity from SCA, Epiroc from Atlas Copco and Nyfosa from Hemfosa. We notice that the dataset is adjusted already. Hence, no manual adjustments are needed.

4.2 Collection of ownership data

We collect ownership data through Modular Finance's software Holdings which compiles ownership data for companies in the Nordic region. The data is available from 2017 (slightly dependent on the company). This study investigates 2017.01.01 – 2021.12.31, hence no manual collection of ownership data from financial reports is required.

Ownership data is often complex and the data that Holdings provides is not always entirely transparent. This is partly due to complex corporate and ownership structures. Therefore, the raw data is not entirely suited to our study. Among other things, we choose to only include the private shareholdings of the board members and management. This means that when a board member or member of the management team represents an investment company, private equity firm, or any other type of corporation, we only include the personal shareholdings and not the shareholding of the company they represent. When management or board members own shares through a privately owned company, we used the software Firmnav to see their ownership of the privately-owned company. Firmnav is an aggregator of mandatory filings such as general meeting protocols and annual reports that are publicly available from Bolagsverket (the Swedish Companies Registration Office) or the equivalent in Denmark, Norway and Finland. If for example, the board member only owns 50% of the private company, we only account for 50% of the shares that the company owns. Furthermore, we exclude ownership through charitable foundations from the sample (the most prominent example being the different Wallenberg foundations) as they lack a formal owner.

In addition to showing the ownership of the largest shareholders in a company, Holdings has a separate data tab which shows management and board member ownership. This data is updated each quarter. However, insider data is only shown for the latest quarter. For a company to be considered insider-owned, management and board members' collective shareholding must be at least 10% at the beginning of 2017 and the end of 2021. To see if companies fulfil our ownership criteria, we look at the latest data from Holdings. In addition to this, we manually check how much equity board members and the management team own at the beginning of 2017. This is done through checking the names of the board members and the management team at the time against the general shareholder list at the beginning of 2017.

In cases where data is missing or in cases where we cannot conclude management and board member ownership of at least 10% beyond a reasonable doubt, we do not include this company in the insider portfolio and categorize it as a non-insider-owned company.

4.3 Final sample and descriptive statistics

The sample from Finbas includes several shares and companies we do not deem relevant for testing our hypothesis. These types of shares and companies we remove are 1) Dual-listed firms, 2) Firms listed on other exchanges than the main market, 3) Illiquid share classes, 4) preference or series D shares, 5) Firms where financial data or ownership data is missing or unreliable.

Table 1:
Original sample

Original sample	**898**
1) Remove due to dual listing	28
2) Remove due to listing on First North, Merkur or Axess	32
3) Remove due to illiquid share class	48
4) Remove due to preference or series D shares	15
5) Remove due to incomplete financials or ownership data	26
Final sample	**749**

Table 1: The sample of tickers downloaded from Finbas before and after cleansing the data. Companies are removed if they are listed on the wrong exchanges, listed on multiple exchanges, have more than one share class listed, are preference shares (or similarly) or lack reliable ownership- or financial data.

Table 2:
Geographical division of sample

	Sweden	**Norway**	**Denmark**	**Finland**	**Total**
Original sample	**409**	**211**	**136**	**142**	**898**
Remove	77	32	23	17	149
Final sample	**332**	**179**	**113**	**125**	**749**

Table 2: The sample as in Table 1 but with a geographic split of the firms before and after cleansing the data.

Including the insider and non-insider definitions we arrive at the following portfolios that are used to test our hypothesis.

Table 3:
Number of firms in our portfolios

	2017	**2018**	**2019**	**2020**	**2021**
Insider	177	200	216	231	240
Non-insider	357	386	414	438	450
Index	**534**	**586**	**630**	**669**	**690**

Table 3: The number of firms in the insider and non-insider portfolios for the years 2017 to 2021. The index is the equal weight index used to compare the returns of our portfolios in section 5. Results and section 7. Discussion. The index consists of all the companies in the sample each year.

Table 4: Share of firms in our portfolios					
	2017	**2018**	**2019**	**2020**	**2021**
Insider	33%	34%	34%	35%	35%
Non-insider	67%	66%	66%	65%	65%
Index	**100%**	**100%**	**100%**	**100%**	**100%**

Table 4: The share of firms in each portfolio between 2017.01.01 - 2021.12.31

Worth noting is that the total sample size of 749 does not match the index each year. This is since the sample includes all companies listed throughout the period while each portfolio only consists of the companies listed during that period. E.g., a company listed between 2017.01.01 – 2021.05.01 will be included in the sample in Table 3 and columns 2017, 2018, 2019 and 2020 but not in column 2021 in Table 4 since it was not listed for the entirety of 2021.

4.4 Data for Fama-French three-factor model

Our sample consists of stocks listed on the Swedish, Norwegian, Finnish, and Danish stock markets. Ideally, we want to run our regressions with a Fama-French factor dataset that is calculated based on a Nordic index. However, no such dataset exists in the public domain. While it is possible for us to create a Fama-French factor dataset based on a Nordic index, it is beyond the scope of this study. We therefore choose to use a proxy. When selecting a proxy for a Nordic Fama-French factor dataset, we can use a Fama-French factor dataset calculated based on a Swedish or European index. The market characteristics are different between the Nordic countries as the representation of industries differs between the countries, see Table 5 and 6. As an example, Norway has many listed companies in the energy and financial sector while Sweden has a lot of consumer, real estate, and healthcare companies. Therefore, analyzing Norwegian stock returns with a Swedish Fama-French factor dataset would make for an unfair comparison. In addition to this, Swedish firms only make up 44% of our sample and this does not justify using a Swedish Fama-French factor dataset in our regressions. We argue that using European French-Factor data is therefore more accurate as all the Nordic countries are included in a European dataset.

Table 5:
Number of firms in each industry

	Sweden	Norway	Denmark	Finland	Nordics
Financials	29	37	27	14	107
Industrials	79	39	31	38	187
Real Estate	32	4	7	4	47
Consumer	62	24	21	31	138
Health Care	58	11	15	7	91
Technology	30	17	6	18	71
Energy	7	38	4	1	50
Basic Materials	21	6	0	7	34
Telecommunications	12	2	1	3	18
Utilities	2	1	1	2	6
Total	**332**	**179**	**113**	**125**	**749**

Table 5: The number of firms in each industry and country. Data is from Nasdaq and Euronext's official industry classification.

Table 6:
Share of firms in each industry

	Sweden	Norway	Denmark	Finland	Nordics
Financials	9%	21%	24%	11%	14%
Industrials	24%	22%	27%	30%	25%
Real Estate	10%	2%	6%	3%	6%
Consumer	19%	13%	19%	25%	18%
Health Care	17%	6%	13%	6%	12%
Technology	9%	9%	5%	14%	9%
Energy	2%	21%	4%	1%	7%
Basic Materials	6%	3%	0%	6%	5%
Telecommunications	4%	1%	1%	2%	2%
Utilities	1%	1%	1%	2%	1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Table 6: The share of firms in each industry and country. Data is from Nasdaq and Euronext's official industry classification.

5. Results

Table 7:
Returns analysis of the different portfolios and indexes

	Insider portfolio	Non-insider portfolio	Long-short	OMX_NORDIC_SEK_GI	Nordic EW Index
Total return	174.11%	103.25%	34.84%	123.48%	123.63%
Annual return	22.34%	15.24%	6.16%	17.45%	17.46%
Monthly return	1.69%	1.19%	0.50%	1.35%	1.35%

Table 7: The total return, the annual return and the monthly return of the different portfolios and indexes during the period 2017.01.01 – 2021.12.31. The long-short portfolio is a market-neutral portfolio that is going long the insider-owned portfolio as well as going short the non-insider-owned portfolio. The insider portfolio only consists of the insider companies and the non-insider portfolio only consists of the non-insider companies.

The total returns, annual and monthly compounded growth rates for the period 2017.01.01 to 2021.12.31 are displayed in Table 7. Returns are shown for the equally weighted insider portfolio which consists of companies that fulfil our criteria of insider ownership. Returns are also shown for the non-insider portfolio that consists of companies that do not fulfil our criteria. Further, Table 7 presents the returns of the long-short portfolio that consists of long positions in companies that fulfil our criteria and short positions in companies that do not fulfil them. The long-short portfolio is market-neutral as the portfolio is long equities that are insider-owned and short equities that are non-insider-owned with equal weights. Lastly, returns are shown for the Nasdaq OMX Nordic All Share Index as well as our constructed equally weighted index.

The insider portfolio generates a total return of 174.11% which corresponds to a compounded annual return of 22.34% (1.69% monthly) while the non-insider portfolio generates a return of 103.35%, which means a compounded annual return of 15.24% (1.19% monthly). The long-short portfolio generates a return of 34.84% during the period which results in a compounded annual return of 6.16% (0.50% monthly). This portfolio is market-neutral and since it has positive returns, this means that insider-owned companies outperform non-insider-owned companies. These results can be compared to the returns of our indexes where the total return of Nasdaq OMX Nordic All Share is 123.48%, corresponding to 17.45% annually and 1.35% monthly while the return of the Nordic EW index is 123.63%, corresponding to 17.46% annually and 1.35% monthly.

6. Regression

6.1 Regression of portfolio-returns

Table 8 below shows the results of the main regression of the insider portfolio and long-short portfolio. We run the regressions with the Fama-French three-factor model based on European data between 2017.01.01 – 2021.12.31. In the results, we are specifically looking at the "Intercept" which is the abnormal return of the portfolio. The abnormal return is the actual return observed by the portfolios subtracted by the expected return based on the Fama-French factor dataset. During the time period of 2017.01.01 – 2021.12.31, the long-short portfolio yields an

abnormal monthly return of 0.40% and the insider portfolio yields an abnormal monthly return of 0.74%, as seen in Table 8.

Table 8:

Main regression

	Dependent variable: Portfolio Excess Return	
	Long-short	Insider portfolio
Intercept	0.0040**	0.0074**
	(0.0018)	(0.0033)
Mkt-RF	0.0475	0.8586***
	(0.0420)	(0.0778)
SMB	-0.1655	0.6551***
	(0.1076)	(0.1992)
HML	-0.0104	-0.0793
	(0.0646)	(0.1195)
Observations	60	60
R2	0.0505	0.7878
Note: Standard errors in parenthesis		**p<0.1; **p<0.05; ***p<0.01*

Table 8: The results from our main regression, based on equation (2). This regression uses a Fama-French factor dataset that is calculated based on a European index. The long-short portfolio is a market-neutral portfolio that goes long the insider-owned portfolio as well as goes short the non-insider-owned portfolio. The insider portfolio only consists of insider-owned firms.

The alpha (intercept) and therefore the abnormal return is 0.74% for the insider portfolio. This overperformance has a p-value of 2.74% which means that the abnormal return of the portfolio is statistically significant at the 5% level. The R^2 value is 78.78% which means that the variables explain 78.78% of the return between 2017.01.01 – 2021.12.31 for the portfolio. During the same period, the long-short portfolio yields a monthly abnormal return of 0.40%. The long-short overperformance has a p-value of 2.69% and the result is therefore statistically significant at the 5% level. The R^2 value for the long-short portfolio is 5.05%.

The table also displays the coefficient for the SMB factor for the two portfolios. This coefficient shows how returns of the portfolio are attributed to how different capitalization stocks perform during the time-period. The coefficient is -0.17 for the long-short portfolio and 0.66 for

the insider portfolio with p-values of 12.97% and 0.17% respectively. Lastly, the table displays the HML factor. This coefficient shows how returns of the portfolio are attributed to how different book-to-value stocks perform during the time period. The coefficient is -0.01 for the long-short portfolio and -0.08 for the insider portfolio with p-values of 87.30% and 50.98%, respectively.

6.2 Robustness check

To check for robustness in the results, we run additional regressions based on another Fama-French factor dataset which is calculated on a Swedish index. This is to check if multiple regressions point us in the same direction and if the overperformance is of the same magnitude and significance. This robustness check is important since we in our main regression use a Fama-French factor dataset calculated on a European index, which we assume acts as a proxy for a Nordic index.

The results of the regressions using a Swedish instead of a European Fama-French factor dataset are presented in Table 9. The regressions show that the alpha is still positive (same direction). However, the magnitude, as well as significance, is lower. The annual overperformance moves from 0.40% in monthly overperformance to 0.11% for the long-short portfolio and from 0.74% to 0.18% for the insider portfolio. The p-value for the intercept is much higher, 66.79% for the long-short portfolio and 62.21% for the insider portfolio. In short, we deem that this robustness test mildly weakens our results as it no longer is statistically significant. On the other hand, the regression with the Swedish dataset only includes three years of data. The reason for this is that the Swedish House of Finance has not released updated the Swedish Fama-French factor dataset for 2020-2021.

Table 9:
Robustness check

	Dependent variable: Portfolio Excess Return	
	Long-short	Insider-portfolio
Intercept	0.0011	0.0018
	(0.0022)	(0.0042)
Mkt-RF	0.0642	0.7412***
	(0.0621)	(0.1165)
SMB	-0.0553	0.4567**
	(0.1011)	(0.1896)
HML	-0.0149	-0.0184
	(0.1307)	(0.2451)
Observations	35	35
R2	0.0486	0.5946

Note: Standard errors in parenthesis **p<0.1; **p<0.05; ***p<0.01*

Table 9: The results from our robustness regression based on equation (2) but with a Swedish Fama-French factor dataset that is calculated based on a Swedish index rather than the European Fama-French factor dataset calculated on a European index (as for the main regression).

Furthermore, we investigate if our portfolios are skewed towards certain industries, and if some industries are over-or underrepresented in the insider portfolio. To do this, we create Table 10 and 11 that show the number and share of firms in each industry for the index as well as the insider and non-insider portfolios. As we see in the tables, there are minor differences between the two portfolios. However, since the portfolios only differ by a maximum of 4 percentage points towards the index and 6 percentage points between the portfolios, we do not deem this to be a skewed sample.

Table 10:
Number of firms in each industry in the two portfolios

	Insider portfolio	Non-insider portfolio	Index
Financials	32	75	107
Industrials	73	114	187
Real Estate	23	24	47
Consumer	56	82	138
Health Care	22	69	91
Technology	28	43	71
Energy	11	39	50
Basic Materials	11	23	34
Telecommunications	3	15	18
Utilities	0	6	6
Total	**259**	**490**	**749**

Table 10: The number of firms within each industry for the portfolios we create (insider-owned and non-insider-owned) as well as for our total sample. Classification is from Nasdaq and Euronext's official industry classification.

Table 11:
Share of firms in each industry in the two portfolios

	Insider portfolio	Non-insider portfolio	Index
Financials	12%	15%	14%
Industrials	28%	23%	25%
Real Estate	9%	5%	6%
Consumer	22%	17%	18%
Health Care	8%	14%	12%
Technology	11%	9%	9%
Energy	4%	8%	7%
Basic Materials	4%	5%	5%
Telecommunications	1%	3%	2%
Utilities	0%	1%	1%
Total	**100%**	**100%**	**100%**

Table 11: The share of firms within each industry for the portfolios we create (insider-owned and non-insider-owned) as well as for our total sample. Classification is from Nasdaq and Euronext's official industry classification.

6.3 Statistical considerations

A risk when conducting regressions with multiple parameters is that they are significantly linearly correlated with each other, a phenomenon that is frequently called multicollinearity (Menard, 2002). To test for multicollinearity, we use the VIF test. For the VIF test we run

regressions between the Fama-French factors and calculate VIF-values through the following equation.

$$(3)\ VIF = 1 / 1 - R^2.$$

Table 12:
VIF - testing for multicollinearity

Factor	Mkt-RF	SMB	HML
VIF	1.42	1.18	1.29

Table 12: The VIF values for the different parameters in equation (2), calculated through equation (3). A VIF value higher than 5 is considered a cause for concern and a value higher than 10 is a serious multicollinearity problem.

Since none of the VIF-values are higher than 5 we draw the conclusion that there seems to be no multicollinearity. The cutoff point of 5 is from Menard (2002) which says that VIF > 5 is a cause for concern and VIF > 10 is a serious multicollinearity problem.

7. Discussion

Table 7:
Returns analysis of the different portfolios and indexes

	Insider portfolio	Non-insider portfolio	Long-short	OMX_NORDIC_SEK_GI	Nordic EW Index
Total return	174.11%	103.25%	34.84%	123.48%	123.63%
Annual return	22.34%	15.24%	6.16%	17.45%	17.46%
Monthly return	1.69%	1.19%	0.50%	1.35%	1.35%

Table 7: The total return, the annual return and the monthly return of the different portfolios and indexes during the period 2017.01.01 – 2021.12.31. The long-short portfolio is a market-neutral portfolio that goes long the insider-owned portfolio as well as goes short the non-insider-owned portfolio. The insider portfolio only consists of the insider-owned firms and the long non-insider only consists of the non-insider-owned firms.

To evaluate the returns generated by this strategy, the insider portfolio and long-short portfolio are compared to market indexes that reflect our sample. We chose the Nasdaq OMX Nordic All-Share Index (OMX_NORDIC_SEK_GI) which is a Gross Index that is value-weighted and consists of all stocks listed on Nasdaq OMX Stockholm, Nasdaq OMX Helsinki, and Nasdaq OMX Copenhagen. A gross index tracks the gross return and considers both the prices of the underlying stocks and the dividends they pay which are assumed to be reinvested. This index reflects our sample as it consists of Nordic equities and dividends are adjusted for since we look at the adjusted closing price.

On the other hand, using the Nasdaq OMX Nordic All-Share Index has shortcomings. Unlike our insider portfolio and long-short portfolio, the index is not equally weighted. In addition to this, the index does not include Norwegian shares. According to Fama and French

(1992) and Banz (1980), small-cap companies outperform large-cap companies. While the Nasdaq OMX Nordic All-Share Index includes large-cap, mid-cap, and small-cap companies, it is a value-weighted index. Therefore, exposure to smaller capitalization companies is significantly less than for an equally weighted index. The comparison between our portfolios, where the exposure to small-cap securities is higher, is therefore somewhat unfair as part of the difference in returns can be attributed to a larger allocation to small-cap companies. To mitigate these issues, we construct our own equity index as an additional comparison for our portfolios. This index is equally weighted and includes all the firms in the Nordic countries (Sweden, Norway, Denmark, and Finland) that are listed on Nasdaq exchanges or the corresponding exchange in Norway (Oslo Stock Exchange / Euronext). This index also makes for a better comparison because it reflects the geographic split of our sample, as it also includes Norwegian equities.

The results outlined in this study show that the strategy of going long insider-owned firms and short non-insider-owned firms generates positive returns in absolute terms. According to the CAPM-theory, if firms with and without insider ownership had the exact same performance, a market-neutral strategy would generate no returns, (assuming the portfolio betas are the same). The fact that it shows positive returns indicates that insider-owned companies outperform non-insider-owned companies on an equally weighted basis from 2017.01.01 – 2021.12.31. Similarly, we see that the insider portfolio has a higher return than the non-insider portfolio. We also see that the insider portfolio overperforms both our benchmark indexes (OMX_NORDIC_SEK_GI and Constructed equal weight index) while the non-insider portfolio underperforms both benchmark indexes.

These results are in line with Jensen and Meckling's (1976) theory of the incentive effect of equity and our hypothesis. Despite this, we cannot conclude that the returns of the long-short market neutral portfolio and outperformance of the insider portfolio are due to management and board members owning shares in the firms. The returns of the portfolios are also affected by other factors, as described by the Fama-French three-factor model (equation 2). These factors are HML, SMB and Mkt-RF. To test our hypothesis, we use a regression which accounts for these factors and therefore highlights the abnormal return in excess of what these variables predict.

Table 8:

Main regression

	Dependent variable: Portfolio Excess Return	
	Long-short	Insider portfolio
Intercept	0.0040**	0.0074**
	(0.0018)	(0.0033)
Mkt-RF	0.0475	0.8586***
	(0.0420)	(0.0778)
SMB	-0.1655	0.6551***
	(0.1076)	(0.1992)
HML	-0.0104	-0.0793
	(0.0646)	(0.1195)
Observations	60	60
R2	0.0505	0.7878
Note: Standard errors in parenthesis		**p<0.1; **p<0.05; ***p<0.01*

Table 8: The results from our main regression, based on equation (2). This regression uses a Fama-French factor dataset that is calculated based on a European index. The long-short portfolio is a market-neutral portfolio that goes long the insider-owned portfolio as well as goes short the non-insider-owned portfolio. The insider portfolio only consists of insider-owned firms.

Our regression results, as outlined in Table 8, show that during the time period of 2017.01.01 – 2021.12.31, the long-short portfolio yields an abnormal monthly return of 0.40%. During the same period, the insider portfolio yields a monthly abnormal return of 0.74%. The p-values for the long-short portfolio and insider portfolio are 2.69%, and 2.74%, respectively. This means that the abnormal returns for the long-short portfolio and insider portfolio are statistically significant at the 5% level. Based on these results, we can reject the null hypothesis.

The R^2 value for the long-short portfolio is 5.05% and the low explanatory value for the long-short portfolio is explained by the fact that the portfolio is both long and short Nordic equities with equal weights. The net exposure is therefore zero and the portfolio is market neutral, which means that the portfolio is exposed to very little market risk. Because of this, the Mkt-RF (Market return – risk-free) coefficient (market beta) which attributes returns to market returns, is significantly lower for the long-short portfolio than for the insider portfolio.

The SMB coefficient is -0.17 for the long-short portfolio and 0.66 for the insider portfolio. These results are a bit more complex since they point in different directions. The coefficient is positive for the insider portfolio which indicates that the portfolio performs more like a portfolio of small-cap stocks. This result is statistically significant at the 1% confidence

level as its p-value is 0.17%. As we see in the sample, the insider portfolio consists of mainly smaller companies, and we now find proof that our portfolio behaves more like a portfolio of small caps. For the long-short portfolio, the coefficient for SMB is -0.17. However, this result is statistically insignificant at the 10% confidence level (but it is close to being significant, as its p-value is 12.97%). That the long-short portfolio moves more like a portfolio of large-cap companies is also reasonable. Since large companies in general have slightly lower expected returns it should be accompanied by lower expected volatility (Sharpe 1964). This effect is also expected by a market-neutral portfolio that should have both lower expected volatility as well as lower expected returns.

The HML coefficient is -0.01 for long-short portfolio and -0.08 for the insider portfolio. The negative values of the coefficients indicate that both these portfolios' returns are more similar to low book-to-value stocks (growth stocks). However, the extremely small value of the coefficient shows that this effect is not especially large during our period and sample. Worth noting is that both these values are far from statistically significant (with p-values of 87.30% and 50.98% for the long-short and insider portfolio).

8. Conclusion

In this study, we investigate and conclude that management and board members' ownership in the firm is positively related to stock price performance. For the time period 2017.01.01 – 2021.12.31, we collect stock price and ownership data for firms that are listed on Nasdaq exchanges (or the corresponding exchange in Norway) in the Nordic countries (Sweden, Norway, Denmark, and Finland). With this data, we categorize the firms in our sample into two different equally weighted portfolios based on our management and board member ownership criteria. With the Fama–French three-factor model (equation 2), we conduct regressions on the data to see if insider-owned companies generate abnormal returns that are statistically significant. The regressions are run on an equally weighted long-short portfolio that goes long insider-owned firms and short non-insider-owned firms and an equally weighted insider portfolio that only goes long insider-owned firms.

Our results, as observed in Table 7, show that the insider portfolio and long-short portfolios generate monthly returns of 1.69% and 0.50%, respectively. As can be observed in Table 8, the insider portfolio yields an abnormal monthly return of 0.74% and the long-short portfolio yields an abnormal monthly return of 0.40%. The results for both portfolios are statistically significant at the 5% level.

To verify our results, we conduct a robustness test by running regressions based on a Swedish Fama-French factor dataset. In our main regression, we use a European index as a proxy for a Nordic index since there is no Nordic Fama-French factor dataset available. The results of this robustness test are presented in Table 9. The regressions show that the abnormal return for the insider and long-short portfolios is still positive. However, the magnitude of the abnormal returns is lower when using a Swedish Fama-French factor dataset compared to a European dataset. The overperformance changes from 0.74% in monthly overperformance to 0.18% for the insider portfolio and from 0.40% to 0.11% for the long-short portfolio. The p-values are also higher than for our main regressions, 66.21% for the insider portfolio and 62.79% for the long-short portfolio. As the abnormal returns are not statistically significant at the 10% level, the robustness test cannot ascertain to what degree insider ownership is related to stock price performance. The high p-values can, however, partly be explained by the fact that we only have

three years of data available for the Swedish Fama-French factor dataset. This can be compared to the main regression, which use five years of data.

From the results of this study, we can see that insider-owned companies outperform non-insider-owned companies. The research of Berle and Means (1932) illustrates the relationship between ownership and control in corporations and later research by Jensen and Meckling (1976) conclude that incentives and decisions change with equity ownership. The effect on agency costs and incentives that come with equity ownership suggests that corporate insiders owning equity is something that increases the value of the firm. Our results are in line with these theories as the insider-owned companies in our data outperform those that are not. Our results of 0.73% and 0.40% monthly overperformance corresponds to an annual overperformance of 9.12% and 4.91% respectively.

9. Implications

Our results indicate that management and board member ownership in firms is an important parameter for an investor to consider when constructing a portfolio and evaluating potential investments. As high insider ownership is correlated with greater stock price appreciation, it can be one way to generate alpha. Furthermore, companies and owners of companies should vouch for increased equity ownership by board members and management teams as this helps align incentives and reduces agency conflicts. This can take multiple shapes. One example would be that board members and management teams should have a higher share of equity-based compensation rather than cash compensation. Other potential implications could be increased shareholder pressure for management teams and board members to purchase equity on the open financial markets.

10. Limitations and considerations

In cases where data is missing or in cases where we cannot conclude management and board member ownership of at least 10% beyond a reasonable doubt, we exclude this data for the insider portfolio and categorize it as a non-insider-owned company. However, instead of categorizing these companies as non-insider-owned, our sample would have been more accurate if we had a third category for firms with uncertain ownership. By doing this, we would have avoided false negatives, classifying some insider-owned companies as non-insider-owned. On the other hand, there are few companies in the dataset that are difficult to classify, and the number of potential false negatives is not deemed a significant part of our sample. Therefore, we believe that this has little to no effect on the regressions or the portfolio returns.

In this study, we define an insider-owned company as a company in which the management and the board members' collective shareholding is at least 10%. To collect this data, we use the data provider Holdings which compiles ownership data for Nordic companies. However, Holdings only shows compiled data of board members and management ownership based on the latest quarterly data. It is not possible to filter this out from old ownership data. This is problematic as a company that is insider-owned in 2021 may not be insider-owned from 2017-2020 and should therefore not be included in our insider portfolio. Because of this, we made the decision that for a company to be considered insider-owned, it must fulfil our criteria (at least 10% ownership by management and board members) both at the beginning of 2017 and at the

end of 2021. To achieve this, we manually cross-check the ownership lists at the beginning of 2017 against names of board and management team members. Ideally, we would have wanted to check board members and management ownership for all the separate years and include the companies in the different portfolios for the periods that they fulfilled the criteria. However, our sample contained 749 different firms. Manually checking the ownership lists and cross-checking with the names of board members and managers for every year would be very time-consuming and we deem it to be out of scope.

During the annotation process, however, we could see that substantial changes in board members and management ownership are uncommon, at least during our five-year period. Based on our sample and the research from Von Lilienfeld-Toal and Ruenzi (2014), ownership does not change rapidly over time. To be classified as a false positive (classifying a non-insider company as an insider company) with our approach, the insiders must fulfil the criteria at the beginning of the period and then decrease their holding substantially (to not fulfil our criteria) and then increase their ownership again. We deem this to be highly uncommon and estimate that the number of false positives is very low. There is a slightly higher risk of false negatives in our data. If a company only fulfils our ownership criteria in either the beginning or at the end of the period, we have not classified it as an insider company. A company should optimally be included in the insider portfolio each year the company is insider-owned. If we identify a company to be insider-owned either in the beginning or at the end of the period and still exclude them, we know that we have at least one false negative. That is because the company should be included in the insider portfolio at least that year. However, due to the slow nature of changing ownership (Von Lilienfeld-Toal and Ruenzi, 2014) and that we only find a few companies that are insider-owned in either the beginning or end of period, we believe that the number of false negatives is fairly low. Nonetheless, this is a limitation in our study and an area of improvement.

In our study, we use equally weighted portfolios. This is because the sample of companies that fulfil our criteria of being insider-owned are mainly small-cap companies. Using an equally weighted portfolio captures the returns of those small-cap companies better than a value-weighted portfolio. If we instead were to use value-weighted portfolios, this would result in the outcome of the portfolio being driven by the idiosyncratic results of a few large-cap companies. However, using equally weighted portfolios also has its downsides. We approach this study from the investor's perspective, and it is therefore relevant that the strategy outlined in this study is replicable at scale in the financial markets. However, this raises concerns about liquidity in the small-cap companies in the dataset. The portfolio conducts monthly rebalancing, and it is likely that a large capital base that utilizes this strategy would have a significant price impact on the small-cap securities in the portfolio. It could also be difficult to build up the equity positions in the first place without significant price impact. Furthermore, there are limitations on going short certain stocks, especially small caps. Some companies might even be impossible to go short (or that it is extremely expensive to borrow stocks to short). The limited scalability of the capital base utilizing this strategy is therefore a downside of the strategy. One improvement would therefore be to include transaction costs (both for purchasing and selling stocks) but also for borrowing stocks to short.

Just as past returns are not indicative of future returns, neither can the outperformance of the insider-owned strategy compared to the market be guaranteed. This is accentuated by the fact that our study only covers five years of historical data. Therefore, we cannot conclude if the outperformance of insider-owned companies is a general phenomenon or whether it is a statistical anomaly due to a small sample as our time-period is limited to 2017.01.01 – 2021.12.3. There are also cases where pure equity ownership does not reflect the true state of the governance of the

company and the incentives. An example of this is the Swedish family company Elekta. The son of the founder of the company who currently serves as chairman only owns 6% of the capital but his shares have more voting rights which leads to him having 30% of the company's votes. In this case, our definition of ownership puts Elekta at below 10% board and management ownership. From a corporate governance perspective, this may suit our profile for a board member and management-owned firm but due to our cutoff point, it is not included in the sample.

Ownership data is also complex regarding companies that operate in a decentralized manner. This is especially the case in firms that carry out many acquisitions. When these "M&A compounders" acquire companies, the companies are not fully integrated into the larger corporate structure. They are allowed to remain autonomous and management teams often roll over their equity in the parent company. Therefore, the management teams of the decentralized subsidiaries may have significant equity stakes in the parent company. However, Holdings and our definition does not classify these individuals as insiders due to them not being the management team of the group. As the subsidiaries are decentralized, one could argue that they are a de facto part of the management team, and very well incentivized. Therefore, the dataset might have been improved by including this into the definition of insider ownership. However, in practice, this is almost impossible to do as this data is not easily available. Some companies also have special structures for employees to become shareholders. An example of this is the second-largest owner (10% of the number of outstanding shares) of the Swedish bank Handelsbanken. It is a foundation called Oktogonen whose beneficiaries are the employees of the bank. While management teams and employees might be incentivized by such a structure, we do not include structures such as Oktogonen as insider ownership in our dataset.

To align the incentives of shareholders and employees in the corporation, some companies choose to compensate employees using option programs. Since options are derivatives, they (can) create incentives similar to owning a corresponding amount of equity. Based on this, we would like to include this exposure in the insider ownership definition. However, we would only want to include options with certain characteristics that create similar exposure and incentives as equity. Options are quite complex and numerous parameters such as duration and strike price are needed to calculate the exact exposure and by extension, incentives. Therefore, it becomes extremely complex and time-consuming to calculate the exposure and incentives for each board member and management team for all the individual companies. Further, the information regarding strike prices for the options held by management or board members specifically is often not available. Instead, this info is only available on an aggregate level (average strike prices for all outstanding options). To address the issue of not being able to calculate the exact exposure, you could choose to count the options as a share and aggregate the shares and options. Another possibility is to exclude the options and only count the shareholding. When investigating a few of the companies' option grants for management teams, we see that many of the options given in a specific year are a bit out of the money (OTM). In general terms, the further the option is in the money, the more similar it is to common stock (with option deltas closer to 1). This means that you are exposed to both the downside, as well as the upside when options are far ITM while not being as exposed (especially to the downside) when options are far OTM. Due to the complexity, lack of information and manual labor required for calculating the exposure, along with the possibility of options being both ITM and OTM, we choose to exclude these. On the other hand, for companies like Evolution AB with large option programs and tremendous historic stock price appreciation (and therefore a lot of ITM options), the method of aggregating the shares and options might be more reasonable. However, we deem this to be a special case that does not reflect the average company.

Another issue with our results is the omitted variable bias, i.e., a factor left out of the model explains much or all the alpha. To improve this, you could conduct multiple other regressions and iteratively test which models explain the phenomena the best. Examples of these models that can be used are, Fama-French and Carhart Four-Factor model that includes a momentum-factor (MOM), (Carhart 1997) and Fama-French Five-Factor model that includes the profitability (RMW) and investment (CMA) factor (Fama and French, 2015).

11. Future research

The relationship between ownership and stock price performance of listed companies is an area of research where there is room for further analysis. So far, research is mainly focused on firms listed in the United States. So, on one hand, there is room to analyze the relationship in other geographies. Replicating this study to new geographies is highly relevant as it explores how different legal and corporate governance systems affect the relationship between ownership and stock price performance. In addition to this, further research can be conducted by changing the parameters of this study or using other metrics for ownership. Below, we discuss suggestions for further research into the relationship between ownership and stock price performance in listed firms.

To measure if management and board members have a significant equity stake, we use the criteria that they in aggregate must own at least 10% of the firm. However, there are other ways of categorizing a "significant equity stake" for an individual. It would be interesting to conduct the same study but to measure the value of the equity stake divided by the yearly compensation of management and board members. Is it considered meaningful that a CEO or member of the board owns stock if their yearly compensation far outweighs the value of their equity stake? A cutoff point for the equity stake divided by yearly compensation would then be decided and the dataset would be divided into portfolios. Another way to approach the topic would be to measure ownership in the firm divided by the net worth of board members and management. However, this might be difficult to do in practice as it in most countries is both difficult and time-consuming to gather data on private individuals' assets.

Due to the lack of transparent ownership data before 2017, the time period for our study is only five years. One suggestion for further research would be to conduct a similar study but with a longer time period. Such a study could also include different economic cycles and include periods of financial distress such as the 2008 recession, the tech bubble crash in 2001 and the real estate crisis in the 1990s.

As discussed earlier, we have some doubts about the practical replicability of the study. The reason for this is that a large capital base utilizing the strategy would likely have a significant price impact on the small-cap securities in the equally weighted portfolio. Paying higher prices would decrease returns for the investor, and potentially eliminate the over-performance. It would therefore be interesting to conduct a study with a value-weighted portfolio and only include mid-cap and small-cap companies (and thereby exclude large-cap companies). This would solve the issue of a value-weighted portfolio being driven by the idiosyncratic results of a few large-cap companies and improve the practical replicability of the strategy.

Lastly, this study only includes the ownership of board members and the management team. However, all employees in a corporation can to a varying extent affect the value of the firm. Therefore, if their incentives change, so should the value of the firm. Based on this, it would be interesting to broaden our study and include all employees as they are all custodians of the firm.

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