The effect of ownership structure on firm performance

-a study of Norwegian listed firms

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Abstract

This paper empirically investigates the relationship between ownership structure and firm performance, treating ownership concentration and owner identity as separate, but dependent dimensions of ownership structure. We use a large sample of quarterly data from non-financial companies at the Oslo Stock Exchange in the period 2001-2007. Using three different econometric approaches motivated by previous studies, we cannot conclude (econometrically) that ownership concentration influences firm performance, measured by Tobin's Q. These findings are in line with previous research on Norwegian data. However, our results on owner identity differ. We find that when international investors hold large fractions of the stocks, or an international owner is the largest shareholder, firm performance is positively affected. The corresponding relationship between government ownership and firm performance is negative. Our findings therefore indicate that including owner identity as a dimension of ownership concentration could increase the insights into the relationship between ownership structure and firm performance.

Acknowledgements

We embarked on the work on this thesis well aware of the complexities and uncertainties associated with the chosen subject. However, we were motivated by an interest in the field of corporate governance, and by the fact that the relationship between ownership structure and firm performance is subject to research and public debate since many questions are still unanswered. We hope that this thesis may provide some new evidence regarding this relationship in the context of Norwegian listed firms.

Writing the thesis has been challenging and demanding in terms of time and effort, but most of all a great learning experience. We would like to thank our supervisor, Associate Professor Tore Leite (NHH), for constructive comments and helpful advice throughout the writing process. We would also like to express our gratitude to Dr.Oecon Aksel Mjøs (SNF/NHH) for valuable support, relevant discussions and for providing access to a comprehensive dataset supported by Folketrygdfondet. Further, we thank Associate Professors Jarle Møen and Tommy Stamland (NHH) for taking the time to discuss empirical issues, Haakon Buer at Børsdatabasen (NHH) for all the hours spent on providing data, and Vidar Nordtømme (Oslo Stock Exchange) along with Einar Bakke (NHH) for providing supplementary data. All these people have given valuable contributions to this thesis. However, all errors are our own.

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Bergen, June 19th 2009.

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Contents

1. Introduction

1.1 Background

Berle and Means' (1932) analysis of the separation of ownership and control represents one of the earliest academic papers on corporate governance. Their findings suggest that when shareholders are too dispersed to enforce value maximization, corporate assets might be deployed to benefit managers rather than shareholders. Although a large number of papers have investigated this issue, the relationship between ownership structure and firm performance still remains ambiguous.

Most empirical studies on ownership structure and firm performance focus on the concentration by outside shareholders, or on the shareholdings by insiders (e.g. boards or management). Although these mechanisms are theoretically believed to affect the separation issue in different ways, they are found to be highly correlated (Demsetz and Villalonga, 2001). Consequently, both measures are used in the study of ownership structure.

A majority of the existing research has considered mature market economies, especially the U.S. and the U.K. Several authors, including Shleifer and Vishny (1986) and McConnell and Servaes (1990), find a positive relationship between ownership structure (insider holdings) and firm performance. Positive results are mainly believed to be in tandem with the arguments by Berle and Means (1932).

Demsetz (1983) pioneered the view that ownership structure should be treated as an endogenous variable, and that this should be taken into account when estimating its effect on performance. Demsetz argues that ownership structure should be thought of as an endogenous outcome of decisions that reflect the influence of shareholders. Hence, the ownership structure brought about by shareholders, whether diffuse or concentrated, should be one that maximizes shareholder profits. According to Demsetz, one should therefore not expect any systematic relationship between ownership structure and firm performance. This is known as the equilibrium hypothesis of Demsetz (1983).

A number of papers (including Loderer and Martin, 1997; Cho, 1998; Himmelberg et al., 1999, Demsetz and Villalonga, 2001) have analyzed the relationship between ownership structure and firm performance, taking into account the endogeneity of ownership structure.

These papers use more complex econometrics, like instrument variables estimation or fixed-effects modeling, and generally find no significant effect of ownership structure on firm performance. These findings are thought to support the equilibrium hypothesis by Demsetz (1983).

Some more recently published research papers (Bøhren and Ødegaard, 2001; Pedersen and Thomsen, 2003; Omran et al., 2008) build on the Demsetz heritage, but include the effect of owner identity. Since owners might differ in terms of wealth, cost of capital, competence, preferences for consumption of perks, and non-ownership ties to the firm, these differences might affect the way they exercise their ownership rights and therefore have important consequences for firm behavior (Thomsen and Pedersen 2000). Consequently, new insights might be revealed concerning the relationship between ownership concentration and firm performance when including owner identity.

The studies above generally find more significant results for owner identity than for ownership concentration. However, results vary from study to study, and they differ in terms of econometric approach to account for owner identity. Moreover, Bøhren and Ødegaard (2001) argue that the studies that include owner identity use a narrow set of categories (often merely two - institutional vs. private, or government vs. non-government). Gugler (2001) argues that the effect of owner identity is "a remarkably unexplored field of research".

1.2 Our contribution to existing research

This paper re-investigates the relationship between ownership structure and firm performance, treating ownership concentration and owner identity as separate, but dependent dimensions of ownership structure. We use a large sample of data, covering non-financial companies on the Oslo Stock Exchange from 2001-2007, on a quarterly basis.

A vast majority of papers on ownership structure and firm performance study firms in the U.S. or in the U.K. However, findings by La Porta et al. (1997, 1998, 1999, and 2000) suggest that a country's legal and regulatory regime is an important factor explaining ownership structure. Recent studies investigating companies in Continental Europe, Asia and Australia have therefore contributed to an increased understanding of the effect of regulatory frameworks. We are aware of two studies that have used Norwegian data. Bøhren and Ødegaard (2001) study Norwegian non-financial companies from 1989-1997, whereas

Pedersen and Thomsen (2003) study companies from Continental Europe, including Norway, from 1991-1995. No study has been based on Norwegian data post year 2000. In section 4 we show that the Norwegian market has gone through a number of changes during the past decade, including increased information flow, professionalization of the institutional environment and increased focus on corporate governance. A re-study of the Norwegian market can therefore reveal if these measures have had an impact on the relationship between ownership structure and firm performance.

Moreover, during the past decade we have witnessed an increased internationalization which has progressively opened trade for international investors on the Oslo Stock Exchange. We show in section 4 that there has been a substantial increase in the level of international ownership at OSE during the period 2001-2007. In that respect, a re-examination of owner identity and firm performance is relevant to investigate whether these changing patterns of ownership at OSE influence the relationship between ownership structure and firm performance.

Previous studies have used annual data to empirically examine the relationship between ownership structure and firm performance. Moreover, there has been a lack of time series to study the relationship, and therefore many studies have relied on cross-sectional analyses. These studies are, however, more vulnerable to extraordinary effects. We have, as (to our knowledge) the first study, used quarterly observations. If we believe that unanticipated changes in ownership structure will be reflected in the stock price of the firm, quarterly data should give more precise results than using annual data. Furthermore, we have a dataset consisting of 28 quarters, which are more time-observations than any other study we know of.

The Norwegian market is well documented, and our dataset allows for calculations of multiple proxies for ownership concentration and firm performance. It gives us the opportunity to check whether our results are sensitive to the choice of performance or concentration measure. Moreover, our data enables us to measure owner identity in two separate ways; by including the identity of the largest owner, or by including aggregate holdings by different owner sectors. The Norwegian Central Securities Depository (VPS) provide a detailed classification of owners, which allows us to group all companies in the sample into five owner sectors: financial institutions, non-financial institutions, international owners, individual owners and the government. Altogether, our detailed and large dataset

should be well suited to produce new insights in the relationship between ownership structure and firm performance.

Finally, in this paper we additionally present an overview of theory and previous empirical studies concerning ownership structure and firm performance, which puts our empirical findings into a wider context. We use methods and variables utilized in previous research, which function as benchmarks for our own research. The theoretical implications of the relationship between ownership structure and firm performance are still in development. Therefore, various econometric approaches have been used to produce new insights. For the econometric methods used in our study, we focus on describing the corresponding assumptions and how the choice of econometric design might affect the results. This provides a foundation to analyze the interaction between ownership structure and firm performance.

1.3 Scope and limitations

Two frequently researched dimensions of ownership structure are ownership concentration and insider holdings. As argued by Demsetz and Villalonga (2001), even though these variables are correlated and can be studied individually, including both will probably yield additional insights. A study of ownership structure and firm performance could further include other governance mechanisms, such as board characteristics, security design and financial policy, among others. Due to limitations in our dataset, we do not include insider holdings or other corporate governance mechanisms. However, we focus more strongly on owner identity than the majority of previous studies.

Our review of previous research shows that a variety of different econometric approaches have been used to investigate the relationship between ownership structure and firm performance. We use a selection of methods, including pooled OLS, fixed-effects regressions and instrument variables estimation (two-stage least squares). Some recent papers have used more complex econometrics of simultaneous equations. However, these methods have been criticized for producing spurious results faced with variables currently used to instrument endogenous variables. Bøhren and Ødegaard (2001) conclude that, until a better theory of the relationship between ownership structure and firm performance is developed, the methods of simultaneous equations might not provide much new insight. We

find that several articles using simultaneous equation fail to fully discuss the implications of low quality instruments.

It is important to underline that analyzing ownership structure in an extended stakeholder perspective is beyond the scope of this paper. We focus solely on the shareholder perspective of ownership structures and its effect on firm performance, measured by the market based ratio Tobin's Q. This issue is further discussed in section 2.1.

1.4 Structure

The structure of the paper is as follows. In section 2 we present our theoretical framework and develop hypotheses regarding the relationship between ownership structure and firm performance. In section 3 we present previous research and comment on issues regarding previous econometric approaches, data quality, and measures of concentration and performance. We then describe the development of the Oslo Stock Exchange in section 4 followed by an empirical analysis in section 5. In section 6 we present our results and discuss our findings. Section 7 concludes.

2. Theoretical framework

2.1 Corporate governance

Shleifer and Vishny (1997) define corporate governance as the ways in which the suppliers of finance to corporations assure themselves of getting a return on their investment. Tirole (2001) argues that the traditional shareholder approach to corporate governance reflected in the above definition is too narrow. In his view, the designer of a corporate governance system must consider how all stakeholders (such as financiers, employees, suppliers, and customers) are affected by the firm's decisions rather than just the financiers (owners and creditors). He extends the focus from shareholders to stakeholders by defining corporate governance as the design of institutions that induce or force management to internalize the welfare of stakeholders. Compared to the shareholder-based definition by Shleifer and Vishny (1997), it seems that a corporate governance system aimed at maximizing shareholder wealth may not promote stakeholder welfare. However, Tirole argues that an operational measure of aggregate stakeholder welfare is unattainable in practice, and that monitoring becomes much harder under multiple missions. He concludes that because managers can rationalize almost any action by invoking its welfare impact on one particular stakeholder, the stakeholder approach to corporate governance is questionable.

We choose to build on Shleifer and Vishny's (1997) shareholder perspective to corporate governance and extend it with the definition of Eckbo (2006), who argues that a company's corporate governance system is defined as the sum of constraints the company's internal organization and external capital market as well as the legal framework place on the opportunity for insiders to expropriate values from minority shareholders.

2.2 Principal-agent theory

Berle and Means' (1932) analysis of the separation between ownership and control in large corporations is one of the earliest academic papers on corporate governance. Their findings suggest that when shareholders are too dispersed to enforce value maximization, corporate assets might be deployed to benefit managers rather than shareholders. Ideas similar to Berle and Means' (1932) were developed more formally by Jensen and Meckling (1976). They define an agency relationship as a contract (explicit or implicit) under which one or more

persons (the principal (s)) engage another person (the agent) to perform some service on their behalf, which involves delegating some decision-making authority to the agent. If the principal and the agent have different objectives, then the agent will not always act in the principal's best interest. The resulting value loss from separating ownership and control is called an agency cost, and corporate governance can be thought of as a set of mechanisms, which reduce such costs, i.e., a system for minimizing the value destruction caused by the agency problem.

Such agency costs come in various forms. First, monitoring costs, which are expenses incurred by the principal in the process of monitoring the agent's activities (e.g. writing and enforcing contracts). Second, bonding costs, which are expenses incurred by the agent in the process of demonstrating that he acts in the principal's best interest (e.g. reporting). Finally, suppose the agent makes decisions and chooses activities that maximize his utility given the constraints imposed by his optimal bonding activities and the principal's monitoring. This leads to the third type of agency costs that is residual loss. In essence, residual loss is the wealth or welfare loss incurred by the principal if the agent's decisions and activities (that presumably maximize the agent's utility given the level of monitoring and bonding) do not coincide with the decisions or activities that maximize the principal's utility. The total agency cost in an agency relationship is the sum of the monitoring cost, the bonding cost and the residual loss.

2.3 Corporate governance mechanisms

In the following we choose to describe several corporate governance mechanisms, due to their importance in understanding the many sides of corporate governance and their potential capabilities. We will focus on ownership concentration and owner identity, and accordingly establish hypotheses which will be tested in the empirical analysis in section 5. Other corporate governance mechanisms are discussed briefly for context insight. A thorough analysis of the effect of all these governance mechanisms is beyond the scope of this paper.

2.3.1 Market competition

According to Bøhren and Ødegaard (2001), the agency context of market competition as mechanism is related to the competition in the firm´s output market. The stronger the competition in the firm´s output market, the less room managers have for wasting corporate

resources. Moreover, managers with firm specific human capital may suffer a welfare loss when looking for a new employer in the event of financial distress. Following Stulz (1988), the market for managerial talent may therefore also function as a governance mechanism.

In the market for corporate control, the threat of a hostile takeover acts as a disciplining device. In this sense, competition functions as a disciplining mechanism on managerial behavior and therefore ultimately assists in reducing agency costs. These arguments also suggest that when products, labor, and takeover markets are fully competitive, a self-serving manager will find it optimal to maximize stockholders' equity. However, we know that real-world markets are not fully competitive and hence the mechanism of market competition as disciplining mechanism cannot do the complete job. Bøhren and Ødegaard (2001) argue that additional corporate governance mechanisms must be seen as supplementary disciplining devices which become relevant once we leave a world where agency problems is the only market imperfection.

2.3.2 Ownership concentration

The agency theory predicts that when ownership is separated from control, corporate value can be destroyed if monitoring of management is weak. However, in order for an owner to have economic incentives to carry monitoring costs, he must hold a sufficiently large equity stake in the firm (Jensen and Meckling, 1976). This can be explained by the fact that minority shareholders are likely to free-ride, and thus share in the value generated by the monitoring conducted by majority shareholders. Moreover, owners must hold a sufficiently large equity stake in the firm to be able to monitor effectively. Shleifer and Vishny (1986) argue that if monitoring by owners improve the quality of managerial decisions, and if there are no other effects of ownership concentration, then performance and concentration will be positively correlated.

If the owners aim to maximize the market value of the firm, ownership concentration implies more monitoring, reduced agency costs, higher expected profits and share prices, because of greater incentive alignment between owners and managers. However, if the dominant owners have other goals, ownership concentration may also have adverse effects from the viewpoint of value-maximizing minority investors. La Porta et al. (2000), Holderness (2001), Fama and Jensen (1983), Morck et al. (1988), and Shleifer and Vishny (1997) all discuss that large owners may benefit at the expense of minority shareholders e.g. by using

access to insider information to their own advantage or undertaking excess expenditure according to their own preferences. Jensen and Meckling (1976) and Morck et al. (1988), argue that increased ownership concentration may therefore imply greater entrenchment in the same way that high managerial ownership may imply managerial entrenchment or diversion of funds, and thereby result in a low market value of the firm.

Moreover, large owners may become risk averse and focus on low risk – low return projects because they have invested a disproportionate share of their wealth in a single firm. Hence, this lack of diversification on the owner side might contribute to lowering firm value.

To sum up, the causal relationship between ownership concentration and firm value is theoretically ambiguous, and thus has to be examined empirically. We therefore propose the following hypothesis on the general level of ownership concentration:

Hypothesis 1: The level of ownership concentration has no effect on firm performance

2.3.3 Owner identity

Following Short (1994) and Pedersen and Thomsen (1997) we propose that an appropriate measure of the link between ownership structure and firm performance must include not only the distribution of ownership shares (i.e., ownership concentration), but also the identities of the relevant owners. Potential owners differ in terms of wealth, costs of capital, competence, preferences for consumption of perks, and non-ownership ties to the firm (Thomsen and Pedersen 2000). These differences may affect the way they exercise their ownership rights and therefore have important consequences for firm behavior. Moreover, we treat ownership concentration and owner identity as separate, but dependent dimensions of ownership structure. To define this we state that owner identity determines the preferences and goals of the owners. This is different from ownership concentration, which determines the power and incentive to enforce these preferences and goals of the owners (Pedersen and Thomsen, 2003).

In the following we classify the owners into individual, financial, non-financial, international, and government ownership sectors.

2.3.3.1 Individual ownership

An individual shareholder represents a personal claim to the firm's cash flow, and can in an agency context be described as a principal monitoring the agent directly. Indirect monitoring,

on the other hand, is likely to occur with government or institutional ownership. Then monitoring occurs through layers of agents acting on behalf of the principal. We can hypothesize that due to direct monitoring individual investors have a positive effect on firm performance, as opposed to institutional and government ownership.

An individual investor might however suffer relative to institutional owners by higher costs of monitoring. Pound (1988) argues that institutional ownership may be more efficient than individual in monitoring, which is due to the opportunity of pooling resources. Moreover, if we assume that individual owners on average possess smaller fortunes than institutional owners, a given ownership share in a company will lead to lower diversification for the individual owner that for institutional owners. Hence, individual owners may become more risk averse and focus on low risk – low return projects because they have invested a disproportionate share of their wealth in one company. Additionally, if individuals on average have lower equity bases, and hence lower ownership shares than other owners, the incentive to perform active corporate governance by individual shareholders, intended to strengthen firm performance, will be less.

Generally, these different hypotheses lead us to say that whether individual ownership matters for corporate performance can only be answered with empirical analysis. We therefore propose the following hypothesis:

Hypothesis 2: The level of individual ownership has no effect on firm performance

2.3.3.2 Financial ownership

Pound (1988) argues that financial institutions as owners may influence performance in three ways. First, he looks at the efficient-monitoring hypothesis which presumes that financial institutions are more competent than other investors. This predicts that such institutions can monitor with higher quality at lower cost. Second, Pound presents the conflict-of-interest hypothesis where institutions, like insurance companies and investment banks, have close business relationships with firms in which they hold shares. Such relationships may involve financial institutional investors voting with management against or in favor of their own fiduciary interest. Finally, Pound presents his strategic-alignment hypothesis where the managers of institutional owners are agents on behalf of other principals which have insufficient value-maximizing incentives. The third hypothesis leads us to the theoretical hypothesis that institutions will monitor with lower quality than would personal owners.

Shleifer and Vishny (1986) and Admati et al. (1994) argue that financial institutions enhance corporate efficiency and improve firm performance in two ways. First, financial institutions perform quality research in order to identify efficient firms to invest in, thereby directing scarce capital to the most efficient use. Second, large institutional ownership in listed firms provide strong economic incentives for financial institutions to monitor managers[1]. Drucker (1986) on the other hand, argues that financial institutions are passive investors who are likely to sell their holdings in poorly performing firms than to expand resources in monitoring and improving their performance. David and Kochhar (1996) reason that financial institutions may take a view of their investment that to a large extent is guided by short-term (e.g. quarterly) goals of beating some key market benchmark such as return on invested assets. Such investment perspectives may have an unfavorable effect on long-term value creation, and therefore also on Tobin's Q.

Generally, these different arguments lead us to say that whether financial institutional ownership matters for corporate performance can only be answered with empirical analysis. We therefore propose the following hypothesis:

Hypothesis 3: The level of financial ownership has no effect on firm performance

2.3.3.3 Non-financial ownership

Allen and Phillips (2000) argue that non-financial firms in particular may create value by holding long-term equity positions in other firms. This may happen when ownership acts as a mechanism for sharing jointly produced profits or to reduce information asymmetries between separate firms participating in a strategic alliance. Long-term partial ownership positions might be useful in aligning the incentives of the firms involved in alliances or joint ventures. Contracting or monitoring costs between firms may be reduced if a significant ownership stake increases the incentives of firms to invest in product market relationships or other relationship-specific assets. Klein et al. (1978) argue that relationship-specific assets create the potential for "holdup" costs between firms. Williamson (1979, 1985) argues that equity can lead to lower contracting costs in product market relationships or can lower the costs of monitoring agreements. In a study, Aghion and Tirole (1994) model several cases in

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[1] These studies include McConnell and Servaes (1990) using a sample of 1000 US firms, and Claessens et al. (1999) investigating a sample of privatized Czech firms, among others.

which the optimal solution, given relationship-specific investments by both parties, may be partial ownership by a downstream firm of an upstream firm.

According to Allen and Phillips (2000), block equity purchases by non-financial institutions could mitigate information problems regarding the investment opportunities of target firms. For example, if asymmetric information has an adverse impact on the cost and availability of external capital, it may be less costly to sell equity to an informed party such as an outside corporation. Under this argument, block equity placements with outside firms provide capital directly to issuing firms (private equity placements) or validate the target's investment opportunities to the capital markets or other capital providers. Non-financial institutions taking large equity positions may also be able to effectively monitor or influence management. They may possess industry knowledge or operating expertise that is superior to financial-institutional owners or other shareholders.

Pound (1988) argues that managers of institutional owners are agents on behalf of other principles which have insufficient value-maximizing incentives. This proposition leads us to conclude that institutions will monitor with lower quality than would personal owners.

Generally, these different arguments lead us to state that the net effect of whether non-financial ownership matters for corporate performance should be answered through an empirical analysis. We therefore propose the following hypothesis:

Hypothesis 4: The level of non-financial ownership has no effect on firm performance

2.3.3.4 International ownership

Agency theory suggests that international investors would be reluctant to perform active corporate governance due to lack of country specific knowledge regarding law, regulation, competition, local investors and corporate strategy (Bøhren and Ødegaard, 2001). Moreover, according to Brennan and Cao (1997), monitoring costs for foreign investors could be considerably high compared with local investors. Bøhren (2002) argues that these effects lead international investors to be reluctant to active corporate governance. From an investor perspective this is a universal phenomenon where investors prefer investing domestic rather than to take optimum risk-return positions due to their lack of knowledge in foreign markets.

On the positive side, Hill (2003) argues that one should expect that foreign ownership helps to ensure development and build competence. Moreover, foreign companies can create values from "spillovers" (Hill, 2003). This includes capital in terms of financial, human and technology resources which foreign investors add through their investment. International investors can further reduce risk through diversification of their portfolios. It can also be argued that international owners are more disconnected from the local society and environment, and hence more easily can take value-maximizing corporate decisions like moving the production or lay-off employees. This effect might be even more pronounced as the companies are more diversified.

For international ownership, we have described both positive and negative effects which might affect firm performance. We suggest that an empirical study is needed to investigate the net effect of international ownership, and therefore propose the following hypothesis:

Hypothesis 5: The level of international ownership has no effect on firm performance

2.3.3.5 Government ownership

According to Shleifer (1998), the main argument for government ownership could be split in two. First, actions based on market failure. Reasons for market failure include externalities, natural monopoly and barriers to entry or asymmetric information. The state can impose rules and regulation to limit market failure, and hence contribute to effective usage of resources. Second, even if the market works, the resulting allocation may not be justified in political terms. In Norway, allocation and equality are frequently used as arguments for government intervention. To achieve these goals, the government can choose between regulation of markets or direct ownership.

The current Norwegian Government's political platform, the Soria Moria Declaration (2005), states, among other things, the following related to state ownership: "Diversified ownership is important for Norwegian business and industry in terms of access to capital and expertise. Diversified ownership is necessary, both private and government ownership and national and international ownership. Norwegian ownership is an important means of ensuring that companies have their head offices and research activities in Norway".

The Government's Ownership Policy (2007) confirms that through its ownership, the government wishes to ensure that head offices in areas of national strategic importance remain in Norway. Government ownership is also a way of achieving other important

political objectives relating to regional policy, transport policy, cultural policy and health policy. The government wishes to ensure national ownership and control of Norway's extensive natural resources, particularly in the energy sector, and further want to ensure that revenues generated by natural resources benefit society as a whole. Extensive government ownership in the energy sector has with increasing energy prices provided extra revenues for the state through the distribution of large dividends in recent years.

Government owners resemble large corporate owners in the sense that both are represented at stockholder- or board meetings by agents who personally have negligible cash flow rights relative to the voting rights they exercise on behalf of the principal they represent (Bøhren and Ødegaard 2001). These misaligned incentives are thought by agent theory to be negative compared to direct monitoring.

The driver behind the process of partly privatized ownership is that politicians acknowledge the advantages to private operation versus state running. One of the reasons why partly privatized companies are expected to perform worse than comparable private ones is the mixture of roles that can occur with government ownership. When politics and socio-economic factors are taken into consideration, and corporate decisions are made because of such reflections, the state, with a controlling position could extract benefits for the government at the expense of the minority private shareholders. To illustrate, Norsk Hydro have cornerstone businesses in rural parts of Norway that has suffered from poor performance. Here the government sought to remain jobs and protect the existence of the local community by influencing corporate decisions through its high ownership stake, against downsizing and moving of production.

It is obvious from the above discussion that the motivation behind government ownership is more than merely financial. Hence, a complete analysis of the effect of government ownership should include a larger stakeholder perspective. It is important to underline that such an analysis is beyond the scope of this paper. We focus solely on the shareholder perspective, analyzing the effect of ownership structure on measures of firm performance. In this perspective, the mixture of roles and incentives with government ownership supports the hypothesis that government ownership is negatively related to firm performance. Hence we propose the following hypothesis:

Hypothesis 6: The level of government ownership has a negative effect on firm performance

2.3.4 Other corporate governance mechanisms

Having presented and discussed both ownership concentration and different owner identities we now introduce other corporate governance mechanisms more generally. The rationale behind including these additional mechanisms is to get an understanding of the multi-fated context behind the various mechanisms of corporate governance that potentially can explain firm performance.

Inside ownership occurs when management or board members own shares of stock. Inside owners influence the agency problem in fundamentally different ways than outsiders, who are not involved in the management of the firm. The key governance function of an outside owner is to monitor the management team, and the incentive and power to do so increases with the outsider's ownership share. On the other hand, increased insider ownership reduces the need for outside monitoring. Jensen and Meckling (1976) predict a positive relationship between insider holdings and firm performance. However Morck et al. (1988) argue the other way, that powerful insiders may expropriate wealth from the outsiders in similar ways that majority shareholders exploit the minority. This is the entrenchment hypothesis, which argues that owner-managers may make value-reducing decisions in order to safeguard their position in the firm. Tirole (2001) points to examples like investing where owner-managers have competence even if this involves investing in declining industries, or conglomerate building to reduce unsystematic risk. Morck et al. (1988) argue that although more insider ownership allows deeper entrenchment in general, one cannot predict the level at which diminishing returns sets in.

The board represents the shareholders as the formal vehicle for observing and influencing the management and corporate decisions. Independence and size are two frequently studied board characteristics by finance researchers. Arguments behind independence are based on the agency idea that the board's primary function is to monitor management. On the other hand, Bhagat and Black (1998) argue that the board supplements the management team and adds value the more board members know about the firm and its environment. They suggest that manager-dependent boards will outperform independent ones. Regarding size, Jensen (1993) argues that increased board size may destroy value because of the board's reduced

ability to communicate, coordinate, and hence monitor. Because of this, Jensen argues that self-serving managers want to increase board size beyond its value-maximizing level. Since agents might have incentives to create boards which are ineffective, agency theory predicts that board size and performance are inversely related.

Equity securities come in different formats, such as equity with full ownership rights (A shares), restricted voting rights (B shares), preferred stock, warrants, and stock options. B shares may be accompanied by more or fewer voting rights and thus deviate from the one-share-one-vote principle. By holding unequal proportions of A and B shares, separation of voting rights from cash flow rights is possible. Dual-class shares may create a conflict of interest between groups of owners which are quite equal to the conflict between majority and minority stockholders with full voting rights. There may be a potential extraction of private benefits for full voting owners. According to Grossman and Hart (1988) and Harris and Raviv (1988), firm performance would be less the higher the fraction of shares outstanding that is non-voting.

A firm's **financial policy**, its capital structure and dividend policy, can influence agency costs. Jensen (1986) argues that there are benefits to debt in reducing agency costs of free cash flows. Payouts to shareholders through dividends reduce the resources under managers' control, thereby reducing managers' power, and making it more likely they will incur the monitoring of the capital markets which occurs when the firm must obtain new capital (Easterbrook, 1984). Since this reduces liquidity and exposes the firm to more intense monitoring by existing and prospective financiers, agency theory predicts that debt financing and dividend payments are value-creating governance mechanisms.

2.4 Legal framework

Having discussed the various mechanisms of corporate governance that potentially explain firm performance we now consider research examining macro-institutional differences regarding the legal and regulatory framework that assist in explaining ownership structure. La Porta et al. (1998) find that the level of investor protection in the Scandinavia's civil law countries is located somewhere in between the U.S. / U.K. and the rest of continental Europe, characterized by offering both majority and minority investor's fair protection. When analyzing the relationship between ownership structure and economic performance it is important to bear in mind that much of the existing research has relied mainly on U.S. or

U.K. evidence, which is not necessarily representative for Norway where the legal and institutional environment is quite different. This has been emphasized in comparative corporate governance research.

La Porta et al. (2000) argue that different ownership structures occur in different countries for several reasons. How developed the financial markets are and the access to external financing differs substantially when comparing the developed world and the developing world including emerging markets. Entrenched financial structures and practices that determine and shape the enforcement of corporate law is one explanation for why the widely held firm is not that frequent observed. From theory we know that contracts are incomplete. Therefore, the country's law system may determine how contracts are enforced and thus determine investor rights.

Shleifer and Vishny (1997) argue that control by large owners may play a positive role as a substitute for legal protection in countries that have weak investor protection and less developed capital markets. This might lead to an expectation of a positive effect of ownership concentration on performance in certain legal systems and financial markets. Morck et al. (1988) claim that high ownership concentration may have a negative "entrenchment" effect on company performance. When analyzing, it is also important to be aware of the different identities of the typical blockholder. According to Becht and Mayer (2001), the typical blockholder in the US/UK are portfolio investors compared to continental European family, government or corporate based blockholders. These blockholders are characterized by having ownership objectives that may differ from the traditional value maximizing approach for the shareholders.

2.5 Market efficiency

Fama (1965) claims that in an efficient market competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market, at any point in time, the actual price of a security will be a good estimate of its intrinsic value.

Generally, one might say that any information that could be used to predict stock performance should already be reflected in stock prices. As soon as there is any information indicating that a stock is underpriced and therefore offers a profit opportunity, investors would flock to buy the stock and immediately bid up its price to a fair level, where only ordinary rates of return, corresponding with the risk of the stock, can be expected. If prices are bid immediately to fair levels, given all available information, it must be that they increase or decrease only in response to new (unpredictable) information. Thus stock prices that change in response to new (unpredictable information) must also move unpredictably. This is the essence of the argument that stock prices follow a random walk, that price changes should be random and unpredictable. The notion that stocks already reflect all available information is referred to as the efficient market hypothesis.

The implication of market efficiency on the relationship between ownership structure and performance is that, given that market participants have an opinion about the effect of ownership structure, an unexpected change in ownership structure should instantly be reflected in the share prices.

2.6 Summary remarks on the theoretical framework

In this chapter we started by choosing a definition of corporate governance which builds on a shareholder perspective. We introduced the agency relationship which occurs between the principal and the agent when ownership is separated from control. Regarding the various corporate governance mechanisms, we discussed the framework of ownership concentration and owner identity and their potential influence on firm performance. Moreover, we treat ownership concentration and owner identity as separate, but dependent dimensions of ownership structure. Based on theory, we proposed the hypothesis that the level of ownership concentration has no effect on firm performance. Concerning owner identity, government ownership is expected to have a negative effect, whereas for the remaining we anticipate no effect. We show that the macro-institutional legal framework in Norway, offering both majority and minority shareholders fair protection, is an important premise to understand ownership structure. Finally, we argue that the efficiency of markets should allow us to expect that, if market participants have an opinion about the effect of ownership structure, an unexpected change in ownership structure should instantly be reflected in the share prices.

3. Previous research

Bøhren and Ødegaard (2001) classify the previous research on ownership structure and performance in three main categories:

1. International comparisons of different institutional environments
2. Event studies of a modified mechanism
3. Cross-sectional analyses of mechanisms in place

The first approach represents a popular research trend pioneered by La Porta et al. (1997, 1998, 1999 and 2000), of comparing governance systems across nations and institutional environments. Their findings suggest that when the legal framework does not offer sufficient protection for outside investors, entrepreneurs and original owners are forced to maintain large positions in their companies which result in a concentrated form of ownership. More generally, findings indicate that a country's legal and regulatory regime influences key characteristics of its security market, ownership structures and valuation processes. They also find that countries belonging to the common-law system of legal regimes have the strongest, and French civil-law countries the weakest, legal protection of investors.

The second and third approaches hold the institutional environment as fixed, investigating how governance relates to performance within a given institutional environment. The second approach, using the method of event studies, investigates the stock price reaction to a change in corporate governance mechanisms. If a change in a governance mechanism triggers a significant stock price reaction, then the mechanism is thought to be relevant for economic performance. Karpoff et al. (2000) concludes that the results of many event studies indicate that the stock price, on average, declines in response to a change making the governance structure more restrictive. Examples include the adoption of certain charter amendments (Jarrell and Poulsen 1987), poison pills (Malatesta and Walking 1988, Ryngaert 1988, Bruner 1991) and state takeover laws (Karpoff and Malatesta 1989). A common explanation for this result is, according to Karpoff et al. (2000), that a restrictive governance structure decreases managers' accountability to shareholders, which is expected to harm the firm's long-term financial performance.

There are both advantages and disadvantages of using an event study methodology. An apparent advantage is the possibility to directly observe what happens to the market value of

equity when a single governance mechanism is altered. However, large unexpected changes in governance mechanisms are rare, and when they occur, they often involve more than just change of ownership (Morck et al. 1988). Another issue, which we also touch upon later in this paper, is the issue of endogeneity. Without controlling for change in other governance mechanisms, the possibility that the performance impact is affected by other mechanisms is ignored. This can lead to spurious correlations.

The third approach, which we use in this paper, compares the performance of firms with different governance structures in place. The common tool to use is some type of regression, normally on a cross-section of firms thought to represent a sufficiently rich variation in the choice of mechanisms (Bøhren and Ødegaard 2001). The most common governance mechanisms in previous studies have been ownership concentration and insider holdings, but also other governance mechanisms, such as owner type, security design, insider holdings, financial policy, market competition and board characteristics (see section 2.3 for further description) have been subjects for study. It is not uncommon that several governance mechanisms are included in the same study. Examples of this includes Demsetz and Villalonga (2001) who study both ownership concentration and firm performance, and Pedersen and Thomsen (2003) who study both ownership concentration and owner identity. Bøhren and Ødegaard (2001) include a wide range of governance mechanisms, including ownership concentration, owner identity, board characteristics, security design, financial policy and market competition.

In the following, we focus on ownership concentration and owner identity as the main corporate governance mechanisms, since these mechanisms are the main subjects of our paper. We present a comprehensive summary of previous studies in appendix 1, explaining key facts about data sets, statistical methods and results for a selection of studies from 1985 to 2008. In the following sections we therefore pay more attention to the broad conclusions and econometric developments than describing individual studies in detail.

3.1 Ownership structure

As discussed in section 2, two conflicting theoretical starting points for the research on the subject have been the thesis by Berle and Means (1932), which suggests that concentration and performance are positively related, and the equilibrium hypothesis by Demsetz (1983), which states that there should be no systematic relationship between variation in ownership

structure and variations in firm performance. Although a large number of papers have analyzed the issue, the relationship between the two variables still remains ambiguous.

Some of the earliest papers investigating the relationship between ownership structure and economic performance date back to the 1930's (Gugler, 2001). However, the majority of the research has been conducted after the 1960s and 1970s, with strong contributions in the 1980s and 1990s. Gugler (2001), listing major empirical studies on the effect of ownership structure on performance from 1932 to 1998, shows that out of 33 empirical studies, 27 deal with outside concentration and 6 deal with insider holdings[2]. The result for outside concentration is positive in 12 studies, neutral in 13 studies and negative in 2 studies.

Most of the historical studies used single equation models, typically regressing a variable for firm performance on a variable for ownership concentration and controls. Frequently used proxies for firm performance include Tobin's Q[3], which is a market based measure, and return on equity or return on assets, which are accounting based measures. Other measures, including income/net worth, have also been used. We discuss the properties of different performance measures in section 3.3.4.

Many of the early studies on ownership structure and performance focused on finding a significant difference between ownership-controlled (OC) firms and management-controlled (MC) firms. According to Gugler (2001) the classification of OC and MC firms was done rather arbitrarily, choosing a specific ownership percentage criterion for a single block of voting stock or other concentration measures. Firms were typically classified as MC if there was no single block of equity/voting power that exceeded 5-10 per cent. However, more recent studies have focused less on the separation of OC and MC firms and more on ownership concentration and managerial and board ownership.

Normal proxies for ownership concentration have been to use either the combined shareholding of the n largest owner(s), the holdings of the n'th largest owner or approximations of the Herfindahl-Index. We discuss the properties of different concentration measures in section 3.3.3.

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[2] For details see Gugler (2001) pp. 15-20

[3] Tobin's Q is calculated as (Market Value of Equity + Book Value of Debt) / (Book Value of Equity + Book Value of Debt)

An important stand in the previous literature and empirical research focuses on the endogeneity of ownership structure in relation to firm performance. As described in section 2, the endogeneity argument was first formulated by Demsetz (1983). He argued that ownership structure is an outcome of shareholders' decisions, and that maximizing firm value may require a concentrated or diffuse ownership structure. Thus, one should not expect to find any relationship between ownership structure and firm performance. Demsetz and Lehn (1985), taking endogeneity into account using a two-stage least squares (2SLS) approach, regressing an accounting measure of profit on ownership concentration and controls for 511 U.S. firms, find no significant effect of ownership concentration on firm performance.

Several other studies have empirically explored the impact of ownership structure on firm performance taking the endogeneity of ownership into account. Hermalin and Weisbach (1991), Loderer and Martin (1997), Cho (1998) and Demsetz and Villalonga (2001) all use simultaneous equations models, assuming that the source of endogeneity is that concentration and performance are jointly determined. They find no significant relationships, and these findings are mostly interpreted as support for the equilibrium hypothesis by Demsetz (1983).

Himmelberg et al. (1999) argue that a large share of the cross-sectional variation in managerial ownership is "explained" by unobserved firm heterogeneity, another possible source of endogeneity[4]. They further argue that this unobserved heterogeneity creates a spurious relationship between firm performance and ownership concentration using a standard OLS approach. Assuming that this unobserved heterogeneity is fixed, they use a fixed-effects panel data approach to handle the endogeneity problem, and find no significant relationship between performance and ownership structure (insider holdings). The fixed-effects approach has, however, been criticized by Zhou (2001), who argued that including fixed-effects may not allow detecting an effect of ownership on performance even though it existed. Khanna et al. (2005) find that the results by Himmelberg et al. (1999) of no correlation between managerial ownership and firm value in a fixed-effects estimation are specific to the period considered. If the sample is extended over another 10 years, the correlation turns out to be significant.

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[4] We do a more thorough discussion of unobserved heterogeneity as a source of endogeneity in section 5.6

Demsetz and Villalonga (2001) argue that, due to considerations such as insider information and performance based compensation, firm performance is as likely to affect ownership structure as ownership structure is to affect firm performance. Loderer and Martin (1997) were among the first to empirically investigate this issue. Using a simultaneous equations approach, they find that insider ownership fails to predict Q, but that Q is a (negative) predictor of insider ownership. Cho (1998) finds, similarly, that Q affects ownership structure, but not vice-versa. Several recent studies include reverse causality in their empirical approaches, among them Pedersen and Thomsen (2003) and Bøhren and Ødegaard (2001).

A majority of research before 2000 has been conducted in the U.S. or in the U.K. However, during the past decade, an increasing number of studies have been conducted outside of these countries, mainly in Europe, Asia and Australia. In Continental Europe and East Asian economies, studies suggest that block ownership might often have a positive effect on firm performance, presumably due to the reduced agency costs resulting from better monitoring. Claessens and Djankov (1999) find that a 10 per cent increase in concentration leads to a 2 per cent increase in short-term labor productivity and 3 per cent increase in short-term profitability in the Czech Republic. Earle et al. (2005) imply that the size of the largest block increases profitability and efficiency strongly and monotonically in Hungary over 1996 to 2001. Xu and Wang (1999) find a positive relationship between concentration and performance in China. Chang (2003) uses a sample of group-affiliated public firms in Korea to examine the simultaneous nature of causal relationships between ownership structure and performance. Their results show that performance determines ownership structure, but not vice versa. Gedajlovic and Shapiro (2002) examine the relationship between the ownership structure and financial performance of 334 Japanese corporations in 1986-1991. They find a positive relationship between ownership concentration and financial performance (proxied by ROA). Minguez-Vera and Martin-Ugedo (2007) analyze the influence of ownership structure on firm value for 118 companies listed in Spain on 31. December 1999. They use Q as performance measure, and find a non-significant relationship between the ownership of large block holders and firm value. Endogenous treatment of these variables reveals a positive effect for the ownership by major shareholders on firm value, although the relationship is not significant. Welch (2003) replicates the study by Demsetz and Villalonga (2001) on Australian listed companies. OLS results suggest that ownership is significant in

explaining performance, but when endogeneity is accounted for, ownership is not significantly dependent on the performance measure.

Bøhren and Ødegaard (2001) conduct a comprehensive study on the Norwegian market, using a dataset covering non-financial companies at the Oslo Stock Exchange from 1989 to 1997. They use a variety of econometrical approaches, from simple univariate OLS regressions to complex systems of simultaneous equations. They also use a wide array of governance mechanisms, including concentration, insider holdings, and owner identity. They find that ownership concentration matters for economic performance. While insider holding is almost always value creating, ownership concentration seems to destroy value. They find that although these effects are robust in single-equation models, the results are sensitive to the choice of performance measure. Moreover, the results become unclear using simultaneous equation models.

3.2 Owner identity

The evidence of owner identity is, according to Gugler (2001), a remarkably unexplored field of research. Moreover, the existing evidence does not provide clear conclusions.

Empirically, the impact of owner identity has often been studied using only two categories, for example institutional vs. non-institutional owners, or state vs. non-state owners (Bøhren and Ødegaard, 2001). However, some recent studies extend the number of owner types studied. Pedersen and Thomsen (2003), studying firms in Continental Europe from 1991-1995, run a set of simultaneous equations on Tobin's Q and ownership concentration for all companies in the sample, then run separate regressions for companies where the largest owner has the following identities: families, financial institutions, non-financial institutions and government ownership. They find that owner identity matters, and that both concentrated ownership by financial and non-financial institutions are associated with positive performance. They further find an insignificant effect on performance for concentrated family ownership, and a negative effect for concentrated government ownership.

Bøhren and Ødegaard (2001) use two different approaches to measure the effect of owner identity on Norwegian firms from 1989-1997. First, they measure how Tobin's Q is linked to the aggregate holdings of different owner types (state, international, individual, financial,

non-financial and intercorporate). Second, they create dummy variables which equal unity if the largest owner of the company is state, international, individual, financial or non-financial. Using a single-equation framework, their results suggest that direct ownership is superior to investing through intermediaries like institutions and the state.

Empirically, there have been studies investigating the effect of government ownership on profitability and firm value. Eckel and Vermaelen (1986), Kole (1996), Hausman and Neufeld (1991) find no effect, but Shirley and Walsh (1998), Dewenter (2001) and D'Souza and Megginson (1999) point to lower performance of government-owned enterprises.

Several studies including Steiner (1996), Han and Suuk (1998), and Thomsen and Pedersen (2000) find a positive impact of (private) institutional investor ownership on firm value. Thomsen and Pedersen (2000) find similar positive effects of ownership by banks and other financial institutions, and Cable (1985) find a positive performance effect of bank ownership on West German firms. However, bank ownership may in principle have different implications for company performance than ownership by pension funds or insurance companies (Pedersen and Thomsen, 2003).

3.3 Comments on previous studies

In this section we try to be specific on the factors we believe can lead to discrepancies among previous studies, or factors that potentially can be weaknesses.

3.3.1 Econometric approach

It is evident from the above description that the study of ownership structure and firm has matured as econometric tools, methods and practice has been further developed. The original approach of regressing a measure of firm performance on ownership concentration and controls will produce biased coefficients in the presence of endogeneity. Hence, the assumption of endogeneity makes it necessary to use more sophisticated econometrical tools.

As described above, the method of two-stage least squares (2SLS), fixed-effects panel estimation and simultaneous equations are all being used to account for endogeneity. We have already outlined the potential weakness of using a fixed-effects approach. The 2SLS and simultaneous equations approaches are both methods of instrument variables (IV). For

these econometrical approaches to produce unbiased estimates, a central condition is to have instrument variables for ownership concentration that are correlated with ownership concentration but uncorrelated with firm performance.[5] If the instruments are not good, meaning a violation of one or two, or both, of the above properties, the method of instrument variables may produce worse results than OLS in the presence of endogeneity (Wooldridge, 2006).

Bøhren and Ødegaard (2001) argue that the current lack of a solid theory behind the choice of instruments should question the use of simultaneous equation methods. They find that several previous studies (including Agrawal and Knoeber, 1996; Cho, 1998 and Demsetz and Villalonga, 2001) do not test their results for different instruments, and hence do not explore the instrument quality question. Moreover, these authors interpret the findings of no correlation between ownership structure and performance as support for the equilibrium hypothesis by Demsetz (1983). The research by Bøhren and Ødegaard (2001) shows that the choice of instrument matters for the results. They also show that it is very difficult to argue that the instruments used in previous research fulfill the requirements stated above. Hence, they suspect that the results of a majority of studies using the simultaneous equations approach are driven by weak instruments. They are therefore not convinced that these results should be interpreted in favor of the equilibrium hypothesis by Demsetz (1983), and conclude that until a better theory exists of how corporate governance and economic performance interact, a simultaneous equations approach might not have much to offer. Still, we find that a lot of recent research papers (including Pedersen and Thomsen, 2003; Omran et al., 2008) continue to use simultaneous equations models and other IV regressions without clearly addressing these issues.

3.3.2 Data quality

There are several data quality issues arising in the previous studies of ownership structure and firm performance. First, large and developed countries are overrepresented in the research, primarily since the disclosure of information is much more restricted, or even not collected, in developing countries. A vast majority of the papers have studied firms from the

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[5] We do a more thorough discussion on Instrument Variables in section 5.7.1

U.S. or the U.K. However, during the last decade an increasing share of studies are done for European, Asian and Australian markets, including developing countries.

Second, as pointed out by Kole (1995), most studies use data from large companies, due to the difficulty of retrieving data from smaller companies. For example, many of the previous studies on U.S. firms investigate Fortune 500 companies.

Third, there is a lack of detailed and consistent ownership data for many countries. Kole (1995) finds that three widely-used sources for ownership data in the U.S. are in considerable disagreement in defining ownership. This affects the coefficients and significance when this data is used in empirical research. Outside the U.S. the general problem is lack of detailed ownership data. Pedersen and Thomsen (2003) investigate Central European firms, and use a measure of concentration described as the fraction of closely held shares. This is the only measure for ownership concentration available in their databases for their sample of European firms. As more detailed data are not available, several studies, including Omran et al. (2008), are also forced to use percentage holdings of the blockholders (for example shareholders holding more than 10% of shares).

Fourth, the availability of time series has been limited. The general trend has been to use cross-sectional data. Ignoring the time-dimension in the datasets makes findings more vulnerable for extraordinary effects and periods. A good example is described previously, where Khanna et al. (2005) find that the results by Himmelberg et al. (1999) would have been significant if including another 10 years in the time series. Obviously, an important factor affecting time series is the low availability of data, which many studies have suffered from. McConnell and Servaes (1990) and Holderness et al. (1999) are some of the exceptions from the cross-sectional studies, comparing data from two periods. More recent studies (including Pedersen and Thomsen, 2003; Bøhren and Ødegaard, 2001; Minguez-Vera and Martin-Ugedo, 2007) have access to longer time series and panel data sets.

3.3.3 Measures of ownership concentration

Ideally, the studies we have described seek to capture the link between the level of ownership concentration and firm performance. However, as Døskeland and Mjøs (2008) discuss, there are several important dimensions of ownership concentration, which may not be captured in one single variable. Measures such as the shareholdings by the largest investor, the shareholdings by the five largest investors combined, as well as a measure of

the relative relationship of strength between owners in the company are all related, but capture different dimensions of ownership structure.[6]

In previous research, normal proxies of ownership concentration have been the percentage of shares held by the n largest or n'th largest shareholder(s), in addition to approximations of the Herfindahl Index. Demsetz and Lehn (1985) use three alternative measures for ownership concentration. They look at percentage of equity owned by the largest 5 shareholders, percentage of equity owned by the largest 25 shareholders and the Herfindahl-Hirschman Index. Demsetz and Villalonga (2001) continue to use percentage of equity owned by the largest 5 shareholders as the measure of ownership concentration.

Non-American studies are often restricted in their choice of concentration measure by the availability of data. Omran et al. (2008), investigating the link between ownership concentration and firm performance in Arab countries, report that they measure ownership concentration as the percentage of shares owned by the largest three blockholders in a firm. They define a blockholder as a shareholder owning 10% or more of the firm's equity.

Pedersen and Thomsen (2003), investigating the same relationship for Continental Europe, measure ownership concentration as something they define as the fraction of closely held shares. This includes fraction of shares held by blockholders including officers, directors and their families, shares held in trust, shares held by another corporation (except in a fiduciary duty by banks), shares held by pension/benefit plans or by individuals owning more than 5%. They use this measure because it is the only generally available measure in Continental Europe and because it is highly correlated with another ownership measure, holdings of the largest shareholder, which according to Pedersen and Thomsen is central for assessing the impact of owner identity.

We conclude the discussion of measures of ownership concentration with three main points. First, there are dimensions of ownership concentration that not one single measure alone can measure. Second, the lack of a common ownership concentration measure can to a large degree be attributed to lack of data. Third, the lack of a common ownership concentration measure makes it more difficult to compare studies across nations and periods.

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[6] We do a more thorough presentation of relevant concentration measures in section 5.3

3.3.4 Measures of firm performance

When Demsetz and Villalonga (2001) summarize research on ownership structure and firm performance, they conclude with two important dimensions which circle around using accounting profit rate, like return on equity (ROE) and return on assets (ROA), or market based ratios, like Tobin's Q or market-to-book, to measure firm performance. These two types of measures differ in at least two dimensions.

The first is the time perspective, which is backward looking for accounting profit rate and forward-looking for market based ratios. The question which is used to illustrate the time perspective to assess the effect of ownership structure on firm performance is whether one should look at an estimate of what management has accomplished or look at an estimate of what management will accomplish (Demsetz and Villalonga, 2001).

The second difference builds on who actually measurers performance. For the accounting profit rate it is the accountant, who is restricted by laws and standards of his profession as accountant. For market ratios it is the business understanding and optimism / pessimism of investors that set the constraints. Since most economists have a better understanding of market constraints than of accounting constraints they are in favor of market ratios. Caution is needed since accounting profit rate is not affected by the psychology of investors, and it only partially involves estimates of future events, primarily in the valuations it places on goodwill and depreciation. The market ratio Tobin's Q includes investor psychology pertaining to forecast a multitude of world events that include the outcomes of present business strategies (Demsetz and Villalonga, 2001).

3.3.5 Classification of owner types

Bøhren and Ødegaard (2001) argue that most studies do not consider owner identity, and that those who do most often include a narrow set of categories. We have argued in section 2.3.3 that different owner types will have different impact when ownership is separated from control. Moreover, since owner identity has not been frequently addressed in previous research, and the classification of owner sectors varies, the basis for comparing results among different studies is limited.

3.4 Summary remarks on previous research

Based on our description and comments on previous research, we suggest that a re-study of ownership concentration and firm performance can provide value along the following dimensions:

First, the theoretical perspectives on how governance mechanisms and firm performance interact are not fully developed. As described in previous sections, Bøhren and Ødegaard (2001) emphasize the lack of a well-founded theory of how the variables in a performance-concentration relationship interact. One consequence is the lack of theoretical foundation regarding the choice of instruments, which is a severe problem for the validity of methods of instrument variables. They find that results to a large extent are driven by weak instruments, and that a majority of previous studies fail to take this into account in their discussions. A study providing new theoretical insight on how governance mechanisms and firm performance interact could further be able to influence the choice of empirical approach. Whether endogeneity is caused by unobserved heterogeneity or simultaneity between the variables has been a subject for debate in previous literature, but no clear conclusion has yet been made.

Second, new research can provide value through increased availability of quality data. Weaknesses in previous research include lack of access to detailed and consistent data. Several studies are limited in choice of concentration measure, and research also shows that there is a lack in consistency in some of the existing data. Moreover, the availability of time series has been low in the majority of previous studies, potentially making the results more vulnerable for extraordinary effects and periods.

Third, new research might provide increased insights into the effect of owner identity. More recent studies on ownership concentration and firm performance have put strong emphasis on the importance of owner identity. However, no common approach of research has been established, and no clear conclusion has been made regarding the importance of different owner identities.

Finally, new research might provide new evidence on Norwegian data. We are aware of two studies that have used Norwegian data. Bøhren and Ødegaard (2001) conduct a comprehensive study on non-financial companies on the Oslo Stock Exchange from 1989-1997. Pedersen and Thomsen (2003) study firms in Continental Europe, including Norway,

from 1992-1995. Hence, no study has yet looked on data after 1997. As we show in section 4, the Norwegian market has gone through a number of changes the past decade. These include an increasing information flow, increased internationalization and opening for international investors, as well as professionalization of the institutional environment and increased focus on corporate governance. A re-study of the Norwegian market can reveal if these measures have had an impact of owner concentration and owner identity in relation to firm performance.

4. Oslo Stock Exchange market development

In this part of the paper we start by presenting key statistics and figures to illustrate the development at the Oslo Stock Exchange (OSE). We then describe central institutional developments and important regulatory changes. Increased professionalization of the market place, with supporting laws and regulations, improves the efficiency in the market in which owners and firms operate in, and hence the context of OSE becomes important to understand the ownership structure – performance interaction.

4.1 Key statistics

4.1.1 Market size, trading volume and listed companies

Figure 1: Key market statistics of OSE (Næs et al. 2008)

[1] Market value (trillion NOK)

[2] Monthly trading volume (billion NOK)

[3] Market value relative to GDP (percentage)

[4] Number of listed companies
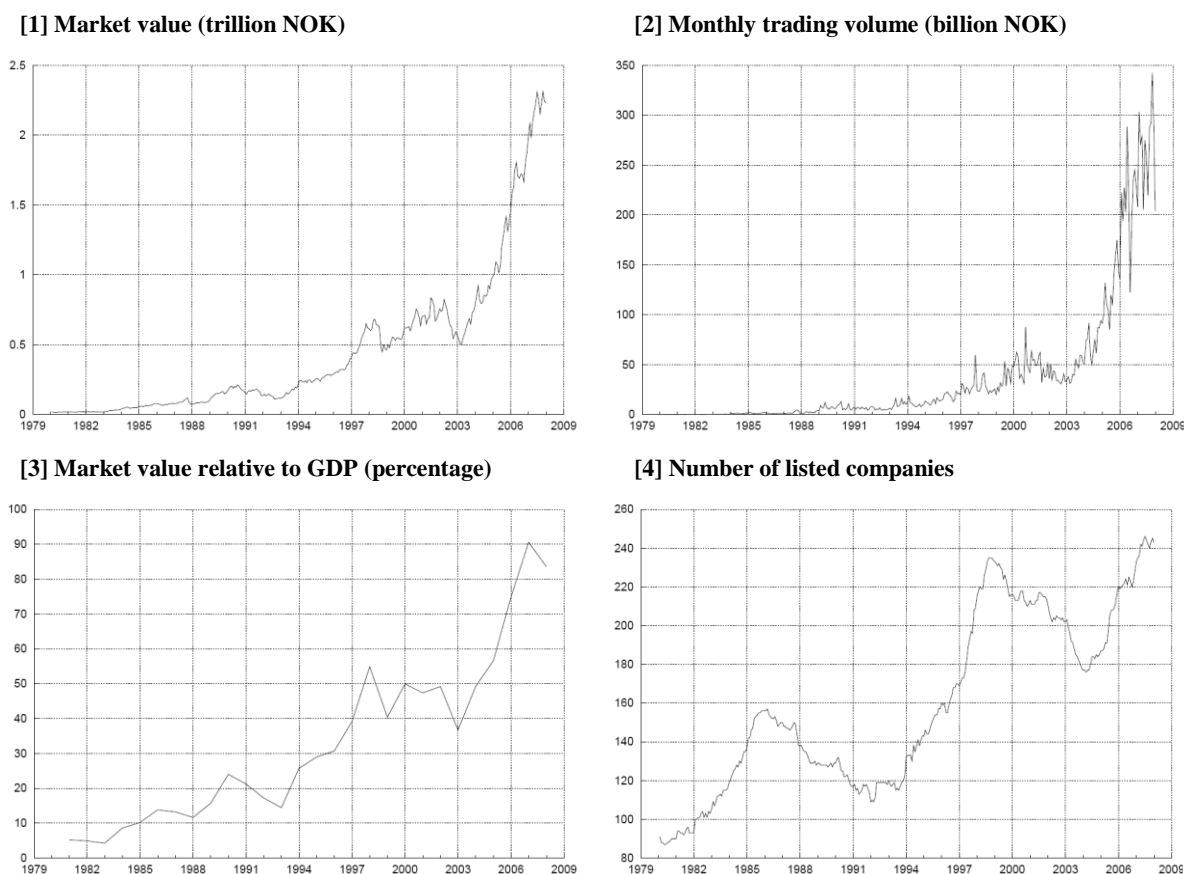
Figure 1 graph [1] shows that the total market capitalization on OSE has gone through a considerable upturn experiencing longer periods with stock price appreciation. In the period after year 2000, stock prices generally went up in the period of 2003-2007, while the market

went down in the period of 2000-2002. In 1980, the total market capitalization was 16.5 billion NOK. At the end of 2007 the total market capitalization was around 2240 billion NOK.

Graph [2] shows that trading volume increased from around 370 million NOK to approximately 200 billion NOK from 1980 to 2007. Consequently, in 2007 the trading volume was higher each day than in one full year in 1980.

To underline the importance of OSE in the Norwegian economy, Figure 1 graph [3] illustrates the value of all stocks on OSE relative to yearly GDP. In 1980/81, the market value of all companies was 5% of yearly GDP. By the end of 2007 this number was at 84%.

From graph [4] we see that the number of companies listed on OSE has increased from 93 in 1980 to 244 in 2007. However, during the period 1998-2004 the number of listed companies fell from 236 to 177. Figure 2 illustrates quarterly IPOs and delisted companies from January 1994 – December 2007. In the period of 1996 – 1998, and from 2004 and onwards, many companies went public. Delisted companies are generally more evenly distributed. As expected, this indicates a positive correlation between the development of OSE and the frequency of IPOs. The change in corporate control that occurs with IPOs, trade sales, mergers and acquisitions is an indicator of how effective the ownership market functions (Døskeland and Mjøs 2008)[7].

Figure 2: IPOs and delistings on OSE 1994-2007 (Døskeland and Mjøs 2008)

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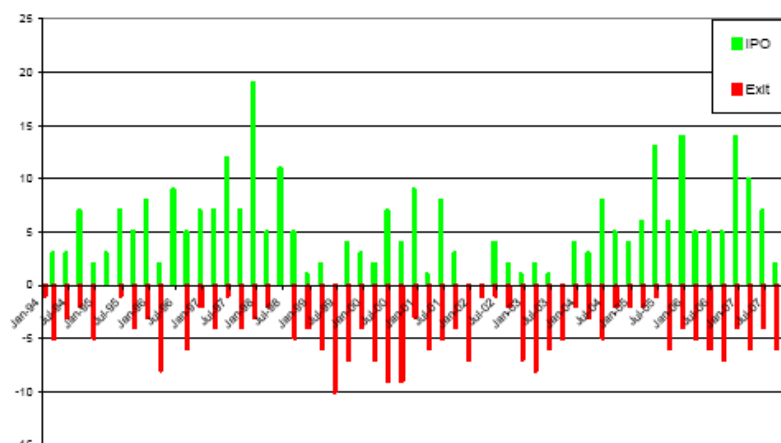
[7] An analysis of this effect is beyond the scope of the paper.

4.1.2 Industry sector development

Figure 3: Industry sector classification (value-weighted)[8]
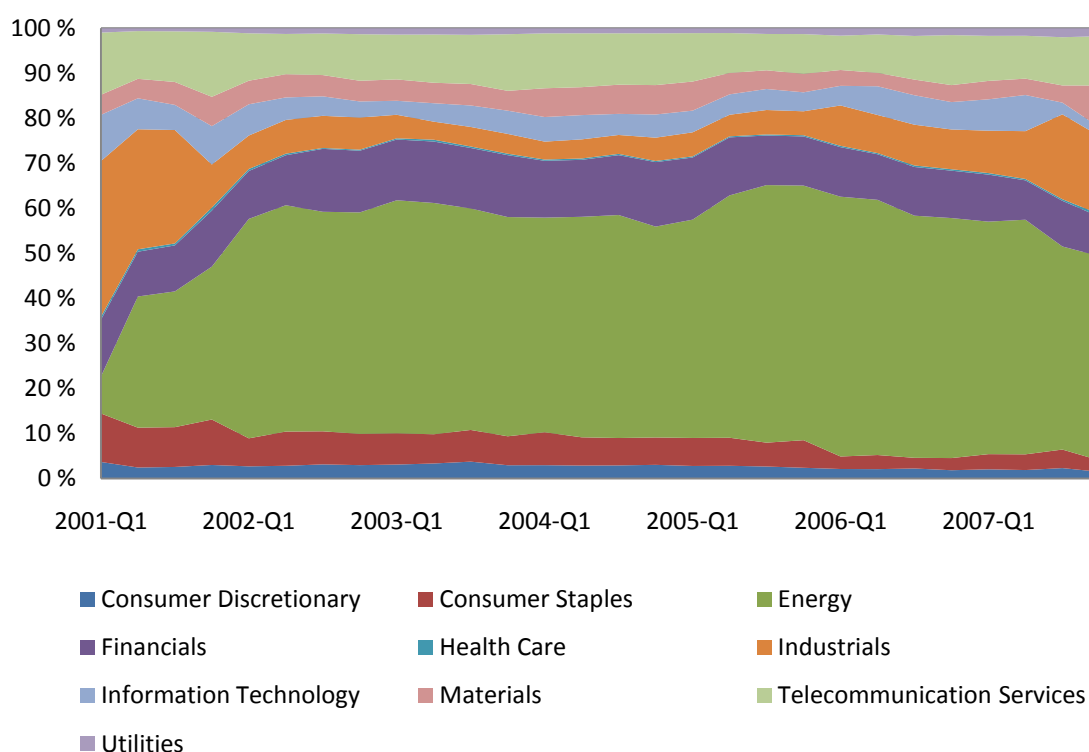
Figure 3 shows the industry sector development on the Oslo Stock Exchange from 2001-2007, based on a Global Industry Classification Standard (GICS) classification defined in section 5.2.4. The major increase in the energy sector during 2001 can to a large degree be attributed to the change in classification of Norsk Hydro, which leaves Industrials and enters Energy in the end of 2001. When the StatoilHydro merger takes place in Q4 2007, Norsk Hydro is removed from the Energy sector and the remaining new Norsk Hydro enters the sector of Materials. Also, in the third quarter of 2007, Renewable Energy Corporation (REC) enters the Industrial sector with a market capitalization of 123 billion NOK following its IPO. Norsk Hydro and REC are expected to explain the large changes in industry sector classification, particularly within Energy and Industrial. Other than this, the sector classification has generally been stable during the sample period.

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[8] This development is calculated based on a dataset excluding companies not primary listed on OSE. Approx. 6% of OSE value are left out. See section 5.2 for details.

4.1.3 Owner sector development

When looking at development of owner sectors, we classify owners into five different categories (see section 5.2.5 for details): international, non-financial institutions, financial institutions, individual investors and government ownership.

International investors is the largest owner sector followed by government and non-financial owners. By the start of 2001 international investors constituted 29.18% of total ownership, and in the fourth quarter of 2007 this proportion had increased to 39.27%. By the start of 2001 governmental owners constituted 28.77%, and in the fourth quarter of 2007 this proportion had increased to 35.52%. Non-financial owners are relatively stabile with 16.55% in 2001 and 17.79% in 2007. Individual and financial owners share in ownership have steadily decreased over the period. The increased focus on international diversification of stock portfolios is to a great extent expected to explain this development[9].

Figure 4 shows a graphical view of the development of the different owner sectors.

Figure 4: Owner sector development (value-weighted)[10]

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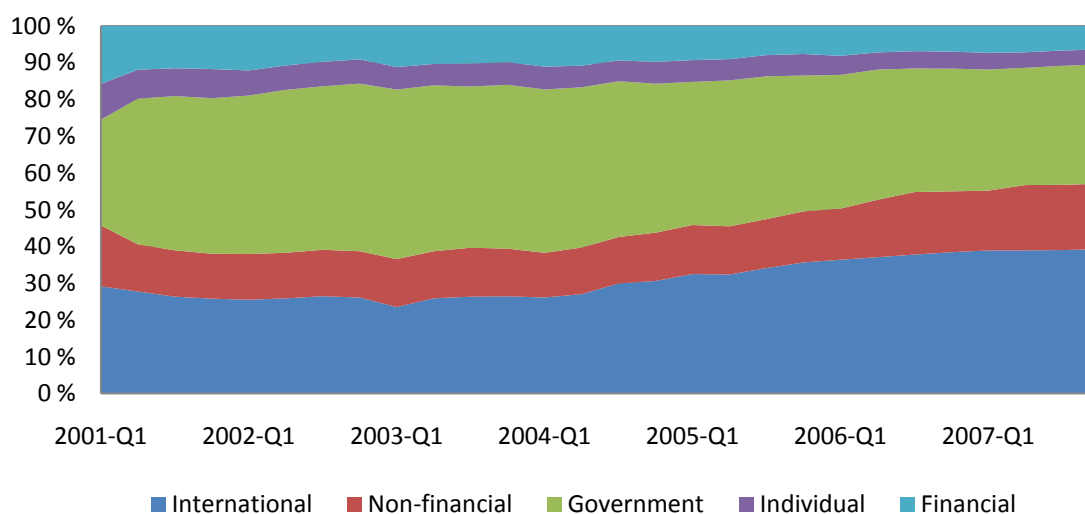
[9] The fact that a significant part of foreign shareholders invest through nominee accounts – in essence anonymous investors - also assists in influencing the ownership picture. The distribution of identity among shareholders indicates less active and engaged owners in listed companies. Fewer participate in general meetings or take place on the board or in other ways actively monitor and influence the governance of listed companies (Døskeland and Mjøs 2008). You can have shareholders who are among the 5 biggest in a company, but still this investment constitutes perhaps only a few percentage of the total value of the portfolio. If this is the case, the investment can receive limited attention because of the small importance to the overall portfolio of the investor. An effect of this can be reduced involvement in companies that constitute the portfolio.

[10] This development is calculated based on a dataset excluding companies not primary listed on OSE. Approx. 6% of OSE value is left out. See section 5.2 for details.

4.1.4 Ownership concentration development

Figure 5: Ownership sector development[11]
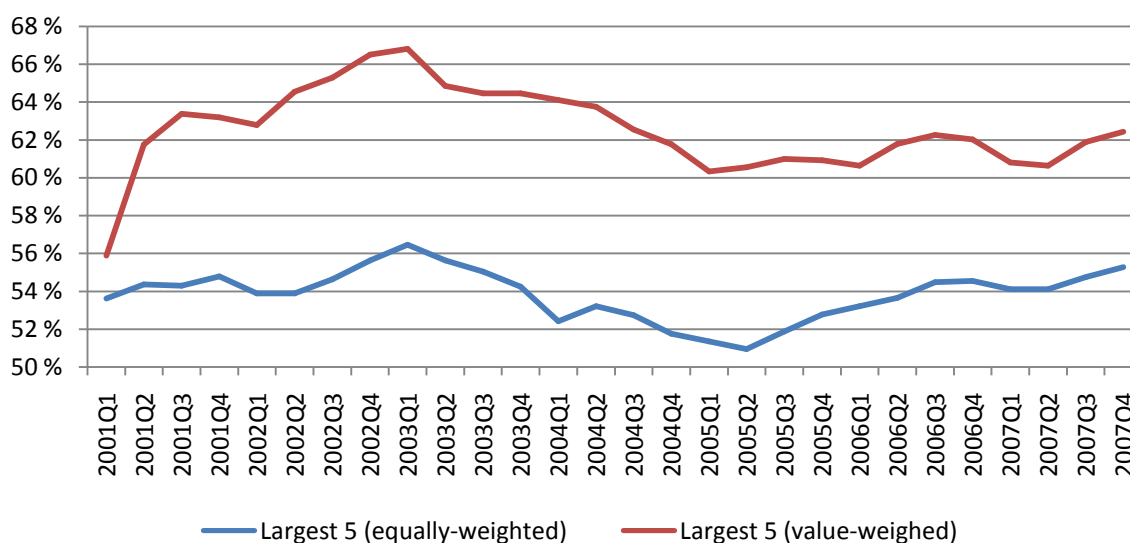
The analysis of the combined ownership share for the five largest owners[12] illustrates moderate changes over time. An interesting development is that ownership concentration among the largest owners has had an upturn over the last 2-3 years of the period, meaning increased ownership concentration. OSE generally has a high concentration among shareholders compared to international numbers on ownership concentration (Døskeland and Mjøs 2008).

If we look to stock markets in the U.S., studies aimed at understanding the ownership structure – performance interaction deal with very large firms in the so-called common law regime, which has an active market for corporate control and hostile takeovers. In addition, U.S. markets are characterized by very low ownership concentration when compared to international standards. Also, very powerful incentive contracts for the management team together with inside directors on boards are common features. On OSE, contrary to the U.S., firms are on average much smaller whereas the legal regime belongs to the Scandinavian version of the civil law system. Ownership concentration is as already mentioned higher,

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[11] This development is calculated based on a dataset excluding companies not primary listed on OSE. Approx. 6% of OSE value is left out. See section 5.2 for details.

[12] We use this measure as a proxy for ownership concentration. Other proxies show similar development. See section 5.3 for details on concentration measures.

hostile takeovers are rare, incentive performance systems are by far not that aggressive, and inside directors on boards mostly not exist (Bøhren and Ødegaard 2001). Therefore, different ownership structure – performance interactions can occur because of a different institutional environment.

4.2 Important regulatory changes influencing investors

The market place and institutional environment has experienced increased professionalization through several dimensions during the past years. This development influences the efficiency in the market. In appendix 2 we list some main areas of efficiency increasing measures.

Naturally, the ownership side of OSE is constantly in development. Much of the change is related to laws and other regulations[13]. In connection to Norway joining the European Economic Area, discrimination of foreign shareholders were abolished in 1995. This caused dual-class securities, free- (for everybody) and locked (only for Norwegians) class of stocks to merge into one single class of stocks. Securities structured with an international quote were abolished. The sum of these changes made the market more effective since investors were treated equally and classes of stocks became larger (Døskeland and Mjøs 2008).

Revised accounting rules from 1999 led investments in securities to by and large be accounted to their respective market value. The effect was increased variation in the value of securities compared with previous use of the principle of the lowest value of market and book. This has no value effect on securities, but could change the behavior of investors, who reports their results, to be more short-term investors in other companies (Boye et al. 2008).

A new shareholder model for taxation of personal shareholders was effective from 2006, meaning that dividends from Norwegian companies would be taxable. Contemporary, new regulations were introduced, which generally limited the tax cost of investments in securities for companies and private households (Boye et al. 2008). According to Døskeland and Mjøs (2008), these regulations only influence some of the Norwegian owner identities, and are therefore expected to have a small effect on the overall stock market.

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[13] A complete documentation of laws and regulations which influence investors on OSE is a comprehensive area and beyond the scope of this paper.

4.3 Summary remarks on the market development

The Oslo Stock Exchange has experienced a significant and historic upturn in stock prices in the period 1980-2007. Market size, trading volume and number of shares listed have all gone up. Concentration has been relatively stable, although increased during the last 2-3 years of the period. International investors is the largest owner sector, followed by the government The shares of these sectors have increased during the period, while individual and financial owners' shares of ownership have steadily decreased. The share of non-financial owners have been relatively stable.

During the past decade we have witnessed an increased internationalization which has progressively opened trade for international investors on the Oslo Stock Exchange. Important regulatory- and institutional changes have resulted in increased efficiency of the markets. Altogether, these effects provide a wider institutional context to later discuss the results following the comprehensive empirical analysis in section 5.

5. Empirical analysis

5.1 Introduction

In this section we start by describing our data set, including key statistics, necessary adjustments and calculations. We continue with regressions in a pooled OLS framework, using single-equation models based on Demsetz and Lehn (1982) and Bøhren and Ødegaard (2001). We discuss the strengths and weaknesses of this approach before we move on to a fixed-effects model, assuming that companies are affected by unobserved heterogeneity which is constant over time. We then move on to an instrument variables framework, discussing the use of instrument variables in previous literature and how our results are driven by the choice of different instruments. In section 6 we conclude by discussing our results from the different approaches.

5.2 Dataset

5.2.1 Description

Our dataset consists of quarterly data in the period 2000-2007 of all companies that have their primary listing at the Oslo Stock Exchange (OSE). The Norwegian Central Securities Depository (VPS) only has complete ownership structure for companies that have their primary listing at OSE. Removing the companies that are not primary listed at OSE from the sample is thus necessary to get a full overview of the ownership structure for the companies in the sample. These removed companies constituted approximately 6 % of the total value of OSE in the end of 2007 and are thus not of significant size.

For each company at each quarter we have data about the holdings of the 50 largest investors (Source: VPS). Each investor has an anonymous id and is classified according to investor sectors defined by VPS (see appendix 5 for details). In addition to ownership data, we have quarterly account information for all the companies in the sample and daily market data (Source: Oslo Stock Exchange / Børsdatabasen NHH). See appendix 3 for a complete list of variables.

A complete dataset would have given us 32 quarters of data. However, since we will use some lagged variables, the year 2000 goes out of the sample, leaving us with 28 quarters and 4744 observations. Hence, our period of study is 2001-2007.

5.2.2 Data adjustments

5.2.2.1 Financial companies

We exclude financial companies from the sample, due to different reporting standards and to be able to compare our results with several other studies that also exclude financial companies (in particular Bøhren and Ødegaard, 2001, since they look at non-financial companies at OSE in the period 1989-1997).

5.2.2.2 Companies listed with A and B shares

Some of the companies are listed on OSE with both A and B shares, either during certain periods or in the full sample. Since holders of B shares are normally not given voting rights at general meetings, we have chosen to exclude the companies with A and B shares from our sample. We only exclude these companies from the sample in the period they are listed with A and B shares, and hence this increases the unbalance of the panel, since these companies will potentially exit and enter the sample during the period. The total number of excluded observations is 453 and we are left with a total of 4291 observations after this adjustment. This exclusion will not affect the quality of our estimates, if the reason why companies choose to have A and B shares is random and not correlated with the idiosyncratic error in our regressions (Wooldridge, 2006).

5.2.2.3 Companies that are being listed or delisted during the period

In calculating two of the control variables, growth in operating income (year-by-year) and return on equity (quarterly, used in the control variable standard deviation of return on equity), we use lagged variables[14]. Since we have companies being listed, and hence entering the dataset, during the period 2001-2007, we will not have enough data to calculate a year-on-year growth in operating income for a given company before one year after the company is listed. If we exclude the observations where we do not have a value for growth in operating income, we exclude the first year, equaling four observations, for every newly

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[14] See appendix 3 for a complete list of variables

listed company. The same thing is done for return on equity and return on assets, but only for one quarter.

From the above paragraph we see that our dataset is systematically biased from excluding the first four quarters for newly listed companies. This adjustment alone removes 781 observations, 18 % of the total observations, and represents a considerable reduction. However, the reduction is not necessarily negative for the quality of our estimates. Among others, Jain and Kini (1994) find a significant decline in firms' operating performance subsequent to IPO's. According to Jensen and Meckling (1976), the reduction in management ownership that occurs when a firm goes public is likely to lead to agency problems, which might be one explanation for the observed decline. They point to the heightened conflict of interest between initial owners and shareholders, which they assume can increase managerial incentives of increasing perquisite consumption. One example of this might be the use of proceeds from the IPO in non-value maximizing projects, from which firm performance will suffer. Jensen and Meckling also point to the fact that companies often "window-dress" their accounting numbers prior to going public, which will lead to pre-IPO performance being overstated and post-IPO performance being understated. A third explanation for the decline in operating performance might be that entrepreneurs time the issue with a period of unusually good performance levels, which they know cannot be sustained in the future.

Døskeland and Mjøs (2008) analyze what happens with ownership concentration before companies are listed and delisted at the Oslo Stock Exchange in the period 1994-2007. Their findings are displayed in Figure 6 and Figure 7.

Figure 6: Ownership concentration development after IPO (Døskeland and Mjøs 2008)
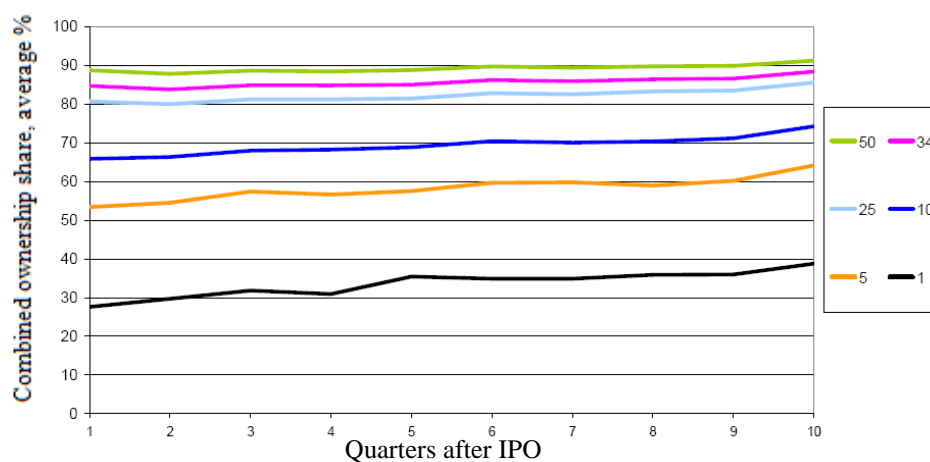
From Figure 6 we see the development of ownership concentration the 10 first quarters after a company is listed. We see that for all measures, there is an increased ownership concentration during the first 10 quarters. Consequently, excluding the first four quarters (as discussed above) should not be negative for the quality of our estimates. Excluding the 10 first quarters, however, will limit our data set considerably.

Figure 7: Ownership concentration development before exit (Døskeland and Mjøs 2008)
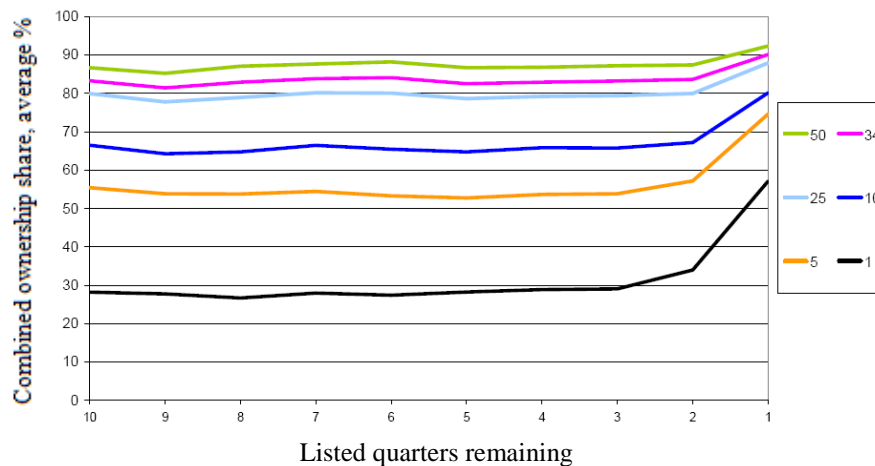
From Figure 7 we see that ownership concentration increases steeply the three last quarters before a company is being delisted. The most significant changes happen during the last two quarters. This increase is naturally explained by the fact that many of the delistings happen due to acquisitions. We have not seen that previous studies on ownership structure and performance correct for this fact. Since we do not have the capacity to classify the delistings, we choose to remove the two last observations from the dataset for every company being delisted. Any company listed the last quarter in 2007 is being kept in the sample, since we do not know whether this is the last quarter the company is listed.

5.2.2.4 Outliers and influential observations

Since OLS minimizes the sum of squared residuals, the estimates are vulnerable to outlying observations. According to Wooldridge (2006), outliers can occur for two reasons: wrongly entered data or sampling from a small sample where one or a few observations have very different characteristics from the rest of the sample. The decision whether to keep or drop these observations is not trivial, since the statistical properties of the resulting estimators are complicated (Wooldridge, 2006).

Figure 8: Scatter plot of Tobin's Q against ownership concentration
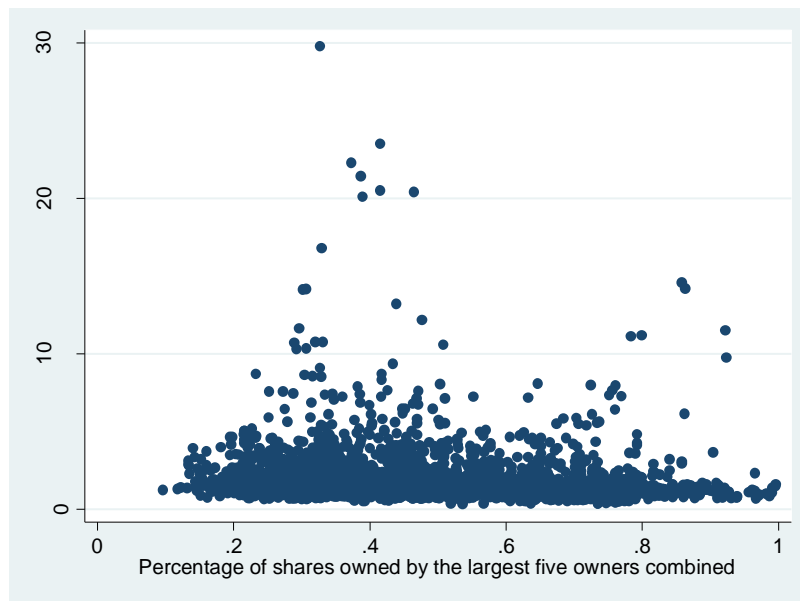
From Figure 8 we see that a majority of observations are grouped close to 1 and below 10. We have a total of 24 observations with a Q value above 10. A closer study of the companies, reveal that the majority are in the IT sector and health care sector.

We choose to not exclude any of the observations with a high Q level at this point, but from this discussion we would expect that the high levels of Tobin's Q in the IT sector and health care sector will result in high values, and possibly increased significance, in these sectors as explanatory variables for Tobin's Q.

Table 1: Average Q by industry

Industry	Average Q
Consumer Discretionary	1.646
Consumer Staples	1.348
Energy	1.441
Financial	1.606
Health Care	4.110
Industry	1.425
Information Technology	2.508
Materials	1.284
Telecommunications	1.429
Utilities	1.566
Average	**1.836**

We see from Table 1 that the average Q values in the health care and IT industry are very high. In later robustness tests, we will exclude observations with extreme values for Tobin's Q to see how this affects our results.

5.2.2.5 Missing observations

We are forced to exclude the observations for which we do not have data on all variables. We cannot avoid this conditioning because we cannot use firms with missing data for the variables of interest. However, we have no reason to believe that there is a systematic factor affecting missing data, and hence we do not believe that these missing data create a bias in our estimates.

5.2.2.6 Summary of adjustments

After doing the adjustments in the dataset described in this chapter, we are left with a total of 3052 observations, which gives an average of 109 observations per quarter. This is a 35% reduction from 4744 observations originally, which represents a significant reduction. However, we believe, as we have argued, that our adjustments will increase the quality of our estimates.

5.2.3 Working with an unbalanced panel

Since some of the firms enter or leave the sample during the period, our panel dataset is unbalanced. According to Wooldridge (2006), working with an unbalanced panel is not necessarily a problem, if the reason we have missing data is not correlated with the idiosyncratic errors, u_{it}. If, however, the reason we have missing data is correlated with the error term, our estimates will be biased. Trying to balance the data set by only including companies that are listed during the whole period will unbalance the sample even more, so we choose to run the regressions on the panel as it is after the adjustments described above. However, we will discuss the bias generated by the unbalanced data set.

As we have described in section 5.2.2.3, there is a correlation between ownership concentration and listing / delisting of the company. Removing the first four / last two quarters for companies being listed / delisted will remove some of this bias from our data set. Any irregular effect of Q during the first four / last two quarters will also be removed. Other effects, however, which are present outside of these periods, will still be present in the data set.

There are several different reasons that companies become delisted. Mergers and acquisitions, bankruptcies or buy-outs are frequent explanations, which probably have different correlations to ownership concentration of firm performance. Without having classified the reasons for exit in our data set, we cannot control for the type of exit, which probably could have revealed some of these links more clearly and allowed us to do some correction for this bias.

5.2.4 Industry sector classification

Since 5.january 2001 the Oslo Stock Exchange has classified companies according to the Global Industry Classification Standard (GICS). This classification standard facilitates industry classification by classifying companies at four different levels – sectors, industry groups, industries and sub-industries. This classification is based upon each company's principal business activity, i.e. the business area that generates the majority of the company's revenues. Therefore, some companies will change GICS classification during the sample period. We classify each company according to the top-level category sector in each quarter. In order to maintain a large number of observations in each category, we choose not to classify in more detail. See section 4.1.2 for an overview of the sector development in the period 2001-2007. The top-level GICS sector classification has the following categories:

Table 2: GICS sectors

GICS sectors
Consumer Staples
Consumer Discretionary
Energy
Financials
Health Care
Industrials
Information Technology
Materials
Telecommunication Services
Utilities

As mentioned in 5.2.2.1, we exclude financial companies from the sample. Additionally, to avoid perfect collinearity[15] we exclude the category Consumer Staples in our regressions and

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[15] According to Wooldridge (2006), including dummy variables that sum up to unity is an example of the so-called "dummy variable trap", since it induces perfect collinearity

use this as a reference group. We choose this group as reference group, because it comprises companies whose consumer businesses are less sensitive to economic cycles. Examples of firms in this sector are manufacturers and distributors of food, beverages and tobacco, as well as non-durable household goods and personal products.

5.2.5 Owner sector classification

Each of the top 50 owners in our sample is classified according to an owner sector classification provided by VPS. We group the owners further into the following categories:

Table 3: Owner sectors

Owner sectors
Individual investors
International investors
Financial institutions
Non-financial institutions
Government

The key motivation behind classifying investors into the above sectors is to investigate whether owner identity matters for firm performance. Aggregation of investors into the above categories gives meaningful entities for further analysis. See appendix 5 for further details about VPS owner sectors and how we group these sectors.

5.3 Ownership concentration

Døskeland and Mjøs (2008) suggest four different types of variables capturing different dimensions of ownership concentration:

- Percentage of shares owned by the largest shareholder: the largest owner will have the strongest incentive to seek to affect the direction of the company; hence this is an interesting measure to study.
- Percentage of shares owned by the 2, 3 …, 50 largest shareholders combined: These measures are also relevant, since they indicate the power held by the different groups of shareholders in voting situations.
- Number of owners needed to reach specific percentages of shareholdings (10%, 34%, and 50%): In Norway, 10% of shareholdings is needed to demand the holding of an extraordinary general meeting. 33% can stop changes in by-laws on general

meetings, while additional decisions demand a minimum of 50% of the votes. Studying how many shareholders are necessary to reach these shares is therefore relevant as measures of voting power.

- The Herfindahl-Hirschman index of different percentages of shareholdings (10%, 34%, and 50%): The Herfindahl-Hirschman index (HHI) is the most widely treated summary measure of concentration in the theoretical literature (Bikker and Haaf, 2000). It is often called the full-information index because it captures features of the entire distribution of shareholders. It is calculated as the sum of squared percentage shareholdings. The HHI will have its maximum value, 1, if one shareholder owns all the shares. It will have its minimum value, 1/n, when all the shareholders have equal sizes. Hence, a lower value will indicate less concentration.

As we see from the above discussion, there are different dimensions of ownership structure that potentially can be thought to affect firm performance. Since we have a detailed dataset, which contains the holdings of the 50 largest owners for each company, we are free to calculate different proxies for ownership concentration. We choose to calculate the following concentration measures:

Table 4: Concentration measures

Concentration measure (variable name)	Calculation method
Percentage of equity owned by the largest shareholder (L1)	This measure is calculated by dividing the number of shares owned by the largest shareholder on total number of shares in the company at the given point in time.
Percentage of equity owned by the largest 3, 5 and 20 largest shareholders (L3, L5 and L20)	This measure is calculated by dividing the number of shares owned by the n largest shareholders combined on total number of shares in the company at the given point in time.
Number of owners to reach specific percentages of shareholdings; 10% and 34 %. (SHARE10 and SHARE34)	
Herfindahl-Hirschman indices within specific percentages of shareholdings; 10% and 34%. (HH10 and HH34)	This measure is calculated by first summarizing the n shareholders' percentages of shareholdings, then calculating the individual owner's share of the combined share. This number is squared and summarized for the number of investors.

One limitation in our dataset is that we only have the holdings of the largest 50 shareholders, not the full list of shareholders. Therefore, we cannot calculate an accurate HHI. We can, however, calculate HHI within the different ownership shares (10%, 34% and 50%), as suggested by Døskeland and Mjøs (2008). This will determine the relative relationships of strength within the different ownership shares.

Table 5: Descriptive statistics for ownership concentration

```
    Variable |       Obs       Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
          L1 |      3052   .2734656    .1698229   .0213114   .9893089
          L3 |      3052   .4487031    .1945917   .0612703   .9903483
          L5 |      3052   .5304452    .1931607   .0961251   .9960845
         L20 |      3052   .7287495    .1617962   .2478974     .99826
     SHARE10 |      3052   1.175623    .4329384          1          6
     SHARE34 |      3052   3.762123    4.080126          1         48
        HH10 |      3052   .9204051    .1845755   .1684374          1
        HH34 |      3052   .5645802    .3348917   .0375937          1
-------------+--------------------------------------------------------
```

Bøhren and Ødegaard (2001), looking at Norwegian non-financial companies from 1989-1997, report a mean value for the percentage of shares owned by the five largest owners (L5 in Table 5) of 0.559, while the corresponding number for the 20 largest owners (L20 in Table 5) is 0.774. The standard deviations are 0.191 and 0.14, respectively. As we observe, the mean concentration and standard deviation are very similar for the period 2001-2007. Demsetz and Lehn (1985), using data for 511 U.S. companies from 1980 and 1981, find a mean of 0.2481 with standard deviation of 0.1577 for the percentage of shares owned by the five largest owners. The corresponding mean and standard deviation for the 20 largest owners are 0.3766 and 0.1673, respectively. As we would expect based on our previous discussion about the legal framework in section 2.4, the mean concentration in the United States is lower than in Norway and Europe in general. Omran et al. (2008), measuring ownership concentration by top three blockholders in Egypt, Jordan, Oman and Tunisia (pooled, yearly data) report a mean of 0.48 with standard deviation 0.22. These results are not very different from what we find (L3 in Table 5).

Table 6: Correlation between different measures of ownership concentration

```
             |      L1       L5      L20   SHARE10  SHARE34     HH10     HH34
-------------+---------------------------------------------------------------
          L1 |  1.0000
          L5 |  0.8354   1.0000
         L20 |  0.6806   0.9157   1.0000
     SHARE10 | -0.4702  -0.5646  -0.5462   1.0000
     SHARE34 | -0.6191  -0.7517  -0.7914   0.7065   1.0000
        HH10 |  0.4939   0.5800   0.5438  -0.9659  -0.6545   1.0000
        HH34 |  0.9116   0.8246   0.7003  -0.5102  -0.6987   0.5344   1.0000
-------------+---------------------------------------------------------------
```

Table 6 shows the correlation between selected concentration measures. The correlations between the percentage shares owned by the largest 1, 5 and 20 owner(s) are very high. Additionally, the correlation between these measures and the Herfindahl-Hirschman indices are high. Consequently, the higher ownership share we observe by the n largest owners, the more disproportional will the relative strength between investors that make up different ownership shares be. Though this may be likely, we must take into account how the HH measure is calculated. The minimum value will always be 1/n, where n is the number of shareholders that combined own, for instance, 34 % of shares. Since we observe a strong negative relationship between the percentage of shares owned by the n largest investors and the number of shareholders needed to combined reach 10% and 34% ownership share, we will expect that as the percentage of shares owned by the n largest owners increase, the n in the HH calculations will decrease, and hence the HH measure will have a higher minimum value. Thus, there is correlation between the percentage of shares owned by the n largest owners and the HH index and therefore the measure should be used carefully. If we had calculated the HH index based on all owners, we would not have had this problem.

We choose to use the percentage of shares owned by the largest 5 owners as the main concentration proxy. This is a measure widely used in previous literature, and is also highly correlated with other measures of ownership concentration that we have calculated. We will conduct robustness tests of our estimates by regressing for other concentration measures, such as the HH index and share of largest owner.

5.4 Firm performance

One of the main differences in our analysis, compared to previous studies, is that we use quarterly data instead of annual data. If we hypothesize that there is a connection between change in ownership structure and firm performance, we would expect a fully efficient market to adjust the share price instantly after a change in ownership structure[16]. Hence, given that market players have an opinion about ownership structure, and act accordingly, quarterly data should give more precise results than yearly data, everything else being equal.

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[16] See discussion about market efficiency in section 2.5

Using accounting profit rate with quarterly data might however be less precise than with annual data. As we expect the accounting profits to reflect past performance, while the market measure reflects expected future performance, the effects of a change in ownership structure should not instantly be reflected in an accounting measure. More time is needed before an actual change is observed. For example, in the case of increased concentration, which might result in increased voting power at the general meeting and hence increased control of management, an actual general meeting will have to be held, in which changes will have to be made before an actual change will be observed. This last argument might be modified, however, saying that it is often the threats or expectations of action from active majority owners that affect managerial behavior.

Nevertheless, we expect a longer lag before we see the effects of changed ownership structure in accounting measures than in market measures. Moreover, the degree of noise in quarterly earnings reports might further invalidate the use of the accounting measure. In a recent quarterly earnings announcement from the insurance company Storebrand, the CEO defended the weak results saying that you cannot judge the company based on quarterly results, due to the large fluctuations experienced in the industry. Their quarterly result was heavily affected by a 400 million NOK loss, which in the annual report may be reported differently if market conditions improve.[17]

We conclude this discussion by choosing Tobin's Q as the main performance measure in our analysis. This has been used most frequently in previous research, and we have also argued that our quarterly data should favor the use of a market measure. However, we will test the sensitivity in our results on performance measure by using accounting based performance measures.

5.4.1 Descriptive statistics

Our focus is on Tobin's Q, but we choose to also calculate ROA and ROE for each company at each quarter, to use these for sensitivity analysis in alternative regression models. Table 7 displays an overview of chosen performance measures, and how the respective measures are calculated.

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[17] Article on DN.no commenting the quarterly results by Storebrand.
<http://www.dn.no/forsiden/borsMarked/article1663989.ece> accessed 14 May 2009

Table 7: Firm performance measures

Performance measure	Calculation
Tobin's Q (Q)	(Market Value of Equity + Book Value of Debt) / Book Value of Assets
Return on Equity (ROE)	Net Income / Average Book Value of Equity for the quarter
Return on Assets (ROA)	Net Income / Average Book Value of Assets for the quarter

Table 8: Descriptive statistics for firm performance

```
    Variable |    Obs       Mean   Std. Dev.         Q1     Median         Q3
-------------+-----------------------------------------------------------------
           Q |   3052   1.861457   1.720914     1.05501   1.38184    2.02044
         ROE |   3052  -.0071514    1.06768    -.027816   .018724    .053864
         ROA |   3052  -.0027882    .070181    -.012449   .007212    .022268
```

Table 8 provides descriptive statistics for the three chosen performance measures. Compared to Bøhren and Ødegaard's (2001) statistics for 1989-1997, our average Q measure is higher. They calculate an average Q of 1.5, with Q1 of 1.0, a median of 1.2 and Q3 of 1.6. From the discussion in section 5.2.2.4 we see that it is likely that our dataset is driven by high values of Q. By investigating which companies have the highest Q values, we find that IT and health care companies are well represented. Opticom is an example of a company with a Q ratio as high as 23 in the beginning of 2001. In our robustness tests, we will test if our results are sensitive for outliers.

5.5 OLS regression

In this section we regress Tobin's Q on ownership concentration and controls. As main concentration proxy we use the percentage of shares owned by the five largest owners. We also test for robustness by using other concentration and performance measures.

5.5.1 Pooled OLS on ownership concentration

In the first model our control variables are industry dummies[18] (GICS), firm size and stock return volatility, as used by Demsetz and Lehn (1985). They also include R&D investments, advertising expenses and investment intensity as controls, but since Norwegian accounting statements do not specify R&D and advertising, these two items are ignored in our model. And since very few Norwegian companies report investment intensity on a quarterly basis, this item is also ignored.[19] We start out with a Pooled OLS model of the following specification:

Equation I: Pooled OLS

$Q_{it} = \beta_0 + \beta_1 LOGL5_{it} + \beta_2 SEC\_COD_{it} + \beta_3 SEC\_ENE_{it} + \beta_4 SEC\_HCA_{it} + \beta_5 SEC\_IND_{it} + \beta_6 SEC\_ITE_{it} + \beta_7 SEC\_MAT_{it} + \beta_8 SEC\_TEL_{it} + \beta_9 SEC\_UTI_{it} + \beta_{10} LOGVALUE_{it} + \beta_{11} SDRETURN_{it} + u_{it}$

Table 9: Description of variables used in the pooled OLS approach

Variable	Definition and calculation
Q	Tobin's Q, measured as (Market value of equity + book value of debt)/(Book value of equity + book value of debt)
LOGL5	Concentration. Calculated as log [L5 / (100-L5)], where L5 is the percentage of shares held by the five largest owners at the end of the quarter (from Demsetz and Villalonga, 2001)
SEC_*	Dummies for different GICS Sectors (See 5.2.4 for details)
LOGVALUE	The logarithm of firm value (book value of assets + market value of equity), calculated at the end of the quarter
SDRETURNQ	Standard deviation of daily returns for the quarter $* \sqrt{63}$, where 63 is the average number of trading days in a quarter

---

[18] As described in section 5.2.4 we use the sector Consumer Staples as reference

[19] When Bøhren and Ødegaard (2001) include this variable, the coefficient is positive, but not significant. Demsetz and Villalonga (2001), including R&D/sales and Advertising/sales as explanatory variables for Q, find positive and significant coefficients (t>2). Excluding these variables should therefore reduce the degree of explained variance of our model

Table 10 illustrates the results when using the fraction owned by the five largest owners as concentration measure, and estimating the model on data pooled for the period 2001 – 2007.

Table 10: Pooled OLS for ownership concentration and controls

```
----------------------------
DEPENDENT VARIABLE:      Q
----------------------------
LOGL5                -0.389***
                     (-5.21)

SEC_COD               0.396**
                      (2.57)

SEC_ENE              -0.008
                     (-0.05)

SEC_HCA               2.991***
                     (16.15)

SEC_IND               0.245*
                      (1.71)

SEC_ITE               1.254***
                      (8.60)

SEC_MAT              -0.071
                     (-0.38)

SEC_TEL              -0.244
                     (-0.83)

SEC_UTI               0.327
                      (0.92)

LOGVALUE              0.162***
                      (8.68)

SDRETURN             -0.006
                     (-0.43)

_cons                -3.082***
                     (-6.09)
----------------------------
r2                    0.190
r2_a                  0.187
N                  3052.000
----------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
```

We see that the coefficient for concentration (LOGL5) is negative on a 99 % significance level. For a given company, the larger ownership concentration we observe, the lower Q we should expect, everything else being equal. This result is in line with the results of Bøhren and Ødegaard (2001). When regressing Q on a similar concentration proxy and similar

controls[20] they also get a negative coefficient of ownership concentration with a p-value of 0,000.

The fact that some industries experience higher levels of Tobin's Q should be captured by the sector dummies, and not be reflected in the concentration variable. We see that the health care sector (SEC_HCA) and the IT sector (SEC_ITE) are associated with higher values of Tobin's Q, and that the coefficients are both significant on a 99% level. We argued in section 5.2.2.4 that these results should be expected, since both sectors are characterized by containing "real option companies" – companies with a low asset base which to a large degree are priced based on expected future opportunities. In addition, the Consumer Discretionary (SEC_COD) sector, which consists of companies which products are thought to be dependent on economic cycles, shows a positive coefficient significant on a 95% level.

The log of firm value is positively correlated with Tobin's Q and significant on a 99% level. This is also in line with the findings by Bøhren and Ødegaard (2001). Other things being equal, a company with high value (measured as market value of equity + book value of debt) will have a higher Q-ratio. This finding is also in line with the research by Næs et al. (2007). In their research on the drivers of stock performance at the Oslo Stock Exchange they find that the size effect has been positive after 2000, although it has been negative for most countries in the period from 1980 to 2000.

Finally, we see that volatility, measured by the standard deviation of daily returns for the quarter, is negative and not significant. This result is also in line with the studies by Bøhren and Ødegaard (2001), finding a negative, but insignificant coefficient of stock volatility as explanatory variable for Q.

5.5.2 Robustness tests

5.5.2.1 Autocorrelation, multicollinearity and heteroskedacticity

The first issue we encounter when doing pooled OLS on panel data is the issue of autocorrelation. As we have multiple observations of the same firm, there is a high probability that intra-firm observations are correlated over time. A Wooldridge test for

---

[20] Using annual data, Bøhren and Ødegaard (2001) can also include "Investment over income"

autocorrelation[21] forces us to reject the hypothesis of zero autocorrelation (p=0,000). Although autocorrelation does not bias the OLS estimates, the standard errors tend to be underestimated, and hence the t-statistics tend to be overestimated.

Another assumption behind OLS is constant variance. When the random variables have different variances over time, the model is heteroskedastic. Although this issue does not produce biased OLS estimates or R-squared, it will bias the estimators of variances, and hence invalidate the standard errors.

A further issue that might bias our regression results is if the governance mechanisms and controls are systematically related to each other. This is called multicollinearity. Worrying about multicollinearity is, according to Wooldridge (2006) "just the same as worrying about a small sample size: both work to increase the variance of beta hat". Even extreme multicollinearity does not violate OLS assumptions. Nevertheless, the greater multicollinearity, the greater standard errors we will have in our regressions. We do not test for multicollinearity, nor do we attempt to work around the issue, but acknowledge that it might affect the significance of our estimates.

We correct for panel-level heteroskedasticity and autocorrelation by repeating the regressions in Table 10, clustering the variance by company[22]. Table 11 illustrates the results when using the fraction owned by the five largest owners as concentration measure, and estimating the model on data pooled for the period 2001 – 2007.

Correcting for panel-level heteroskedasticity and autocorrelation by clustering the variance removes some significance from our results. Table 11 shows that concentration is still negative for the whole period, and on a 95% significance level. We believe that a model robust for heteroskedasticity and autocorrelation is more appropriate than the first pooled OLS model, and will continue to use this robust version throughout the chapter on pooled OLS.

---

[21] A user-programmed function "xtserial" in STATA

[22] The STATA function regress ..., cluster () estimates the model by OLS but uses the linearization/Huber/White/sandwich (robust) estimates of variance (and thus standard errors). These variance estimates are robust in the sense of providing correct coverage rates to much more than panel-level heteroskedasticity. In particular, they are robust to any type of correlation within the observations of each panel/group. (Source: <http://www.stata.com/support/faqs/stat/xtgls_rob.html> accessed 2 June 2009) This method should be the correct to use when we have a panel with an n which is much larger than the average t.

Table 11: Pooled OLS for ownership concentration - robust for heteroskedasticity and autocorrelation

```
----------------------------
DEPENDENT VARIABLE:       Q
----------------------------
LOGL5                 -0.389**
                      (-2.13)

SEC_COD                0.396**
                       (1.99)

SEC_ENE               -0.008
                      (-0.06)

SEC_HCA                2.991***
                       (6.56)

SEC_IND                0.245
                       (1.54)

SEC_ITE                1.254***
                       (4.30)

SEC_MAT               -0.071
                      (-0.25)

SEC_TEL               -0.244
                      (-1.11)

SEC_UTI                0.327***
                       (2.60)

LOGVALUE               0.162***
                       (3.48)

SDRETURN              -0.006
                      (-1.16)

_cons                 -3.082**
                      (-2.39)
----------------------------
r2                     0.190
r2_a                   0.187
N                   3052.000
----------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
```

A fourth problem in doing a pooled OLS regression is encountered if the underlying structure between the variables changes over the period. Then, a time-independent specification may not capture the true picture, and we will have an instable model. We work around this issue by doing year-by-year analyses. From the year-by-year regressions summarized in Table 28 in appendix 6 we see no indication of a shifting relationship. Rather, we see that the observed effects are stronger in certain periods than in others. We conclude that there is no clear change in the underlying structure between variables over time.

5.5.2.2 Modelling with different sets of control variables

To test the robustness of our results, we run the model with different specifications. First, we evaluate the choice of controls. Næs et al. (2007) find that the returns on OSE stocks might be very well explained by a multi-factor model containing the market index, a size index and a liquidity index.

Table 12 shows the results from including firm size (book value of assets + market value of equity) and volatility (mean spread for daily observations from the quarter) as control variables, together with sector dummies. We see that coefficient for concentration (LOGL5) is still negative on a 99% significance level. The coefficient for firm value (LOGVALUE) is positive on a 99% level, whiles both the IT and health care sectors (SEC_ITE and SEC_HCA) are significant at a 99% level. The industrial (SEC_IND) and consumer discretionary (SEC_COD) sectors are also positive on 95% and 99% significance levels compared to the consumer staples sector.

Liquidity is positively correlated to Tobin's Q. Our result shows that Q decreases as the spread increases (volatility decreases), all else being equal. This finding is not in line with the research by Næs et al. (2007), who find that exposure to low liquidity gives a significant risk premium at OSE. To check whether the result is affected by how it is measured, the mean of daily spreads for the quarter, we run the same model using the average spread the previous year. Our results are qualitatively similar and still significant on a 99% level.

A test for use of different controls, motivated by Næs et al. (2007), does not give us qualitatively different answers. Therefore, we choose to continue using the original model.

Table 12: Pooled OLS with second set of controls

```
----------------------------
DEPENDENT VARIABLE:      Q
----------------------------
LOGL5                 -0.315***
                      (-4.05)

SEC_COD                0.443***
                       (2.86)

SEC_ENE                0.012
                       (0.08)

SEC_HCA                2.963***
                      (16.01)

SEC_IND                0.300**
                       (2.09)

SEC_ITE                1.258***
                       (8.64)

SEC_MAT               -0.000
                      (-0.00)

SEC_TEL               -0.204
                      (-0.69)

SEC_UTI                0.342
                       (0.96)

LOGVALUE               0.136***
                       (6.72)

MEANSPREAD            -0.987***
                      (-3.33)

_cons                 -2.284***
                      (-4.08)
----------------------------
r2                     0.193
r2_a                   0.190
N                   3050.000
----------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
```

5.5.2.3 Modelling with different proxies for ownership concentration

Motivated by the discussion in section 5.3 we run regressions with alternative concentration measures; percentage of shares held by largest owner, percentage of shares held by the five largest owners, and a Herfindahl-Hirschman index within 34% ownership. We continue to control for industry sector affiliation, firm size and stock return volatility.

Table 13: Pooled OLS with different concentration measures

```
-------------------------------------------------------------
DEPENDENT VARIABLE:    Q               Q               Q
-------------------------------------------------------------
LOGL5                 -0.389**
                      (-2.13)

HH34                                  -0.532**
                                      (-2.45)

LOGL1                                                 -0.299**
                                                      (-2.45)

SEC_COD                0.396**         0.387**         0.366*
                      (1.99)          (2.00)          (1.87)

SEC_ENE               -0.008           0.025          -0.009
                      (-0.06)         (0.19)          (-0.06)

SEC_HCA                2.991***        3.054***        3.011***
                      (6.56)          (6.59)          (6.55)

SEC_IND                0.245           0.243           0.228
                      (1.54)          (1.56)          (1.46)

SEC_ITE                1.254***        1.258***        1.212***
                      (4.30)          (4.53)          (4.34)

SEC_MAT               -0.071          -0.067          -0.119
                      (-0.25)         (-0.23)         (-0.39)

SEC_TEL               -0.244          -0.212          -0.199
                      (-1.11)         (-1.07)         (-1.04)

SEC_UTI                0.327***        0.136           0.139
                      (2.60)          (1.22)          (1.21)

LOGVALUE               0.162***        0.170***        0.172***
                      (3.48)          (3.59)          (3.62)

SDRETURN              -0.006          -0.005          -0.004
                      (-1.16)         (-0.93)         (-0.79)

_cons                 -3.082**        -0.829          -2.959**
                      (-2.39)         (-1.24)         (-2.49)
-------------------------------------------------------------
r2                     0.190           0.192           0.194
r2_a                   0.187           0.189           0.191
N                   3052.000        3052.000        3052.000
-------------------------------------------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
LOGL5: Combined shareholdings of the largest 5 owners
HH34:  Herfindahl-Hirschman index within 34% ownership share
LOGL1: Shareholdings by the largest owner
```

From Table 13 we see that the three different concentration measures are all negative and significant on a 95% level, and the control variables behave similarly in all three regressions. This suggests that our model is robust for different types of proxy for ownership concentration. Hence, continuing to use percentage owned by the 5 largest investors

(LOGL5) should not produce significantly different results than other concentration measures.

5.5.2.4 Modelling with different proxies for firm performance

To test for the effect of the chosen concentration measure, we run regressions with different performance measures (Tobin's Q, ROE and ROA), controlling for firm size and stock liquidity. Motivated by Demsetz and Lehn (1985) we include a 5-period historic average[23] ROA and ROE (avROA and avROE) in addition to the current period ROA and ROE.

Table 14: Pooled OLS for different performance measures

```
--------------------------------------------------------------------------
DEPENDENT VARIABLE:    ROE          avROE          ROA          avROA
--------------------------------------------------------------------------
LOGL5                -0.066         0.001          0.010         0.006
                     (-1.14)        (0.04)         (1.64)        (1.04)

SEC_COD              -0.112         0.031*         0.015**       0.010
                     (-0.72)        (1.79)         (2.10)        (1.52)

SEC_ENE              -0.147         0.004         -0.006        -0.009
                     (-0.89)        (0.07)        (-0.90)       (-1.43)

SEC_HCA              -0.185        -0.021         -0.010        -0.006
                     (-1.18)       (-0.62)        (-0.62)       (-0.38)

SEC_IND              -0.169         0.001          0.005        -0.001
                     (-1.08)        (0.02)         (0.73)       (-0.18)

SEC_ITE              -0.213        -0.036         -0.001        -0.003
                     (-1.29)       (-1.26)        (-0.11)       (-0.43)

SEC_MAT              -0.134        -0.009         -0.009        -0.022
                     (-0.82)       (-0.32)        (-0.72)       (-1.48)

SEC_TEL              -0.187        -0.041         -0.023**      -0.030***
                     (-1.16)       (-0.96)        (-2.00)       (-3.65)

SEC_UTI              -0.073         0.064***       0.022***      0.024***
                     (-0.51)        (4.69)         (4.58)        (5.33)

LOGVALUE              0.016         0.013          0.009***      0.008***
                     (1.34)         (1.01)         (4.94)        (4.38)

MEANSPREAD           -0.339        -0.214         -0.025        -0.002
                     (-0.79)       (-1.35)        (-1.48)       (-0.14)

_cons                -0.405        -0.155         -0.076*       -0.082*
                     (-1.56)       (-0.86)        (-1.78)       (-1.95)
--------------------------------------------------------------------------
r2                    0.005         0.013          0.064         0.121
r2_a                  0.002         0.008          0.061         0.116
N                  3050.000      2218.000       3050.000      2218.000
--------------------------------------------------------------------------
t statistics in parentheses            * p<0.10, ** p<0.05, *** p<0.01
```

---

[23] Demsetz and Lehn (1985) use annual data and include a 5-year historic average

We find no statistically significant result for ownership concentration using ROE or ROA as performance measure. If we average ROA and ROE over the past 5 periods, as has been a common approach in previous literature[24], the results still hold. However, for a majority of the accounting measures, the concentration coefficient is positively related to performance, although not significant.

It turns out that the coefficients for ownership concentration are qualitatively comparable whether we use a five-period historical average or instead use a five-period future average. The rationale behind using a future average would be that a change in ownership concentration at one point might influence future performance, and hence future accounting figures.

We see that using accounting measures, no clear conclusion can be made. We continue to use Tobin's Q as the main performance measure, since we favor the use of a market based performance measure with quarterly data, and since this measure has been widely used in previous research.

5.5.2.5 Outliers and influental observations

To check whether our results are sensitive to outliers, we remove the values with Tobin's Q larger than 10. This cut-off point is randomly chosen. Repeating the regressions in Table 10 and Table 12 without outliers gives qualitatively the same results as the original regressions. Hence, we do not find that our current results are driven by extreme values.

5.5.2.6 Implications of robustness tests

Using a model robust for autocorrelation and heteroskedasticity weakens the significance of our variables. However, this correction seems necessary, and therefore we continue to use this model when regressing for owner identity in the next session.

Including a different set of control variables does not increase the explanatory power of our model. Therefore, we choose to keep the original set of control variables.

---

[24] See Demsetz and Lehn (1985) and Bøhren and Ødegaard (2001). They both run models using the average ROE for the past five years as dependent variable.

Running the model with different proxies for ownership concentration shows that our results do not seem to be driven by the choice of concentration measure. We choose the shareholdings of the five largest owners as our main proxy for ownership concentration.

We find no significant results using accounting measures of firm performance. As we have argued, we do not believe accounting measures to be appropriate when operating with quarterly data, and hence we continue to use Tobin's Q as the main performance measure. Testing the results for a different market based performance measure would potentially have provided increased insights regarding the effect of different market based performance measures.

5.5.3 Owner identity

As described in section 5.2.5, we classify the owners into five main categories: financial, non-financial, government, international and individual. Bøhren and Ødegaard (2001) use the same categories, enabling us to compare our results to a previous study on Norwegian data.

5.5.3.1 Owner identity measured by aggregate ownership

We first study the importance of owner identity by repeating the pooled OLS regression on ownership concentration and controls, adding new control variables for the aggregate fraction of shares held by the different owner sectors.

Since all the five variables for aggregate ownership sum up to one, including all of these as control variables in our regression will lead to econometric challenges of perfect collinearity. To work our way around this issue, we start by controls for all identities, except financial. The coefficient of the other aggregate owner fractions will have to be interpreted with financial ownership as the reference owner group.

In these regressions we continue to include ownership concentration, measured by the aggregate shareholdings by the 5 largest owners. We include capital structure (debt-to-assets) as control variable instead of stock price volatility to make our regression comparable to Bøhren and Ødegaard (2001).

Table 15: Pooled OLS by aggregate ownership with financial owners as reference owner group

```
----------------------------
DEPENDENT VARIABLE:      Q
----------------------------
LOGL5                 -0.124
                      (-0.68)

SEC_COD                0.251
                       (1.25)

SEC_ENE               -0.185
                      (-1.12)

SEC_HCA                2.663***
                       (5.65)

SEC_IND                0.227
                       (1.26)

SEC_ITE                1.046***
                       (3.52)

SEC_MAT               -0.402
                      (-1.21)

SEC_TEL                0.074
                       (0.34)

SEC_UTI                0.226
                       (1.39)

ID_ACC_GOV            -1.403
                      (-1.42)

ID_ACC_IND             0.393
                       (0.70)

ID_ACC_INT             1.019
                       (1.10)

ID_ACC_NFI            -0.138
                      (-0.17)

DEBTASSETS            -0.772**
                      (-2.18)

LOGVALUE               0.191**
                       (2.56)

_cons                 -1.700
                      (-1.18)
----------------------------
r2                     0.222
r2_a                   0.219
N                   3052.000
----------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
```

Our first observation when including variables for aggregate ownership is that the degree of explained variation increases (R^2 increases from 0,187 to 0,219). Moreover, the coefficient for ownership concentration is no longer significant, suggesting that this effect might have been captured by the identity variables. The health care and IT sectors are still significantly positive, and the log of firm value is significant and positive on a 95% level. The new control, debt to assets, is also significant on a 95% level.

We observe that the coefficient for aggregate government ownership is negative. Aggregate individual and international ownership show positive coefficients, while non-financial ownership shows a negative coefficient. However, none of the coefficients are significant on a 90% level compared to financial owners as reference.

Since the above results are interpreted with financial owners as reference, we extend this analysis by running four additional regressions, so that we run regressions with all owners sectors as reference. Table 16 shows a summary of results.

Table 16: Pooled OLS by aggregate ownership – summary

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		+	-	+	-
Non-fin.	-		-***	+***	-
International	+	+***		+***	+
Government	-	-***	-***		-**
Individual	+	+	-	+**	

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

Table 16 provides more insight into the question of owner identity. Our first observation is that the coefficient for aggregate international ownership is positive compared to all other owner sectors, and significant compared to non-financial institutions and government. Secondly, the coefficient for aggregate government ownership is negative compared to all other owner sectors, and significant compared to non-financial institution, individual and international investors.

If we run the same models without clustering variance, as done in Bøhren and Ødegaard (2001), we get highly significant results for accumulated government and international ownership. The main conclusion by Bøhren and Ødegaard (2001) is that direct investment seem superior to investing through intermediaries like institutions and the state. Our results support that this might be the case, but the positive coefficients for individual ownership lacks significance when compared to institutional ownership. Only compared to government the results are significant.

We have to be careful in how we interpret these results. Since we include both a concentration variable and variables for aggregate ownership in the model, the interpretation of the identity effect should consider both. A positive coefficient for aggregate international ownership and a negative for ownership concentration reflect a tendency that although concentration, using pooled OLS, is negatively correlated with firm performance, this tendency is so pronounced when international owners as a group hold large stakes. However, it is more pronounced when the government holds large owner shares.

If we remove the variable for ownership concentration from the regressions on owner identity above, the explained variation in the model stays the same. Moreover, we observe that the significance of the identity variables increases. Since we have reasons to believe that there is a dependency between the identity variables (as one increases, another will have to decrease), we should be careful how we interpret these results. However, the results support the hypothesis that owner identity is important for firm performance, and that whether or not concentration is positive depends, at least partly, on owner identity.

5.5.3.2 Owner identity measured by the identity of the largest owner

The above section uses the aggregate fraction of shares held by different owner groups as control variables to measure the effect of owner identity. In this section we instead include the identity of the largest owner as control variable in a similar regression. This might provide increased insights, as it measures the effect of owner identity slightly differently.

As in the previous chapter, we start out by using financial owners as the reference owner group, and add dummy variables that equal unity if the largest owner is non-financial, international, government or individual. We continue using the same controls.

Table 17: Pooled OLS by identity of largest owner

```
----------------------------
DEPENDENT VARIABLE:       Q
----------------------------
LOGL5                 -0.355**
                      (-2.10)

SEC_COD                0.373*
                      (1.74)

SEC_ENE               -0.076
                      (-0.49)

SEC_HCA                2.691***
                      (5.79)

SEC_IND                0.304*
                      (1.71)

SEC_ITE                1.111***
                      (3.79)

SEC_MAT               -0.271
                      (-0.85)

SEC_TEL               -0.033
                      (-0.15)

SEC_UTI                0.222
                      (1.22)

ID_GOV                -0.550
                      (-1.20)

ID_IND                 0.323
                      (0.80)

ID_INT                 0.218
                      (0.64)

ID_NFI                -0.095
                      (-0.30)

DEBTASSETS            -0.859**
                      (-2.30)

LOGVALUE               0.208***
                      (3.67)

_cons                 -2.982**
                      (-2.20)
----------------------------
r2                     0.214
r2_a                   0.210
N                   3052.000
----------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
```

From Table 17 we see that concentration is significantly negative on a 95% level, and that the controls behave similarly as in the model with aggregate shareholdings. The coefficient of government as the largest owner is negative, but not significant. The same is true for non-

financial institutions as the largest owner. The coefficients for individual and international owners as the largest owners are positive, but not significant.

Since the above results are interpreted with financial owners as reference, we extend this analysis by running four additional regressions, so that we run regressions with all owners sectors as reference. Table 18 shows a summary of results.

Table 18: Pooled OLS by identity of the largest owner – summary

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		+	-	+	-
Non-fin.	-		-*	+*	-
International	+	+*		+***	-
Government	-	-	-***		-**
Individual	+	+	+	+**	

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

Table 18 shows that using identity of the largest owner as measure of owner identity gives results very similar to using aggregate ownership. The coefficients for financial and non-financial institutions, as well as government, have the same sign, but are overall less significant. Individual ownership is positive compared to all owner groups, but only significant compared to government. International is positive for all reference groups except for individual investors.

These two methods of measuring the effect of owner identity are both imperfect, and capture different dimensions of concentration and identity. Therefore, both should be considered, and potentially more measures should be investigated. Nevertheless, the main impression from using these models is that owner identity matters. Government aggregate ownership is associated with negative effect on Tobin's Q, while international ownership is associated with positive effect. Both should be interpreted in light of the fact that concentration is associated with a negative overall effect of Tobin's Q.

5.5.4 Endogeneity

According to Wooldridge (2006), the most critical assumptions needed for unbiasedness in an OLS estimator is the assumption of exogenous explanatory variables. This assumption is formally stated as:

$$E(u|x_1, x_2, \ldots, x_k) = 0$$

If one or more of the explanatory variables are correlated with the error term, u, this assumption is violated, and we say they are endogenous explanatory variables. This will bias the OLS estimator.

One way this assumption might be violated is if one or more of the explanatory variables are mis-specified in the equation, typically this is the case if the true relationship we are trying to model includes a squared term for one of the explanatory variables and we do not. Another form for mis-specification is if we use a level variable when we should have used a log variable. We have not found reasons to believe that altering the functional specification will increase the explanatory power of our model. An interesting question, however, is whether we should include log (Q) as dependent variable. It can be argued that since Q only contains positive values, and maybe also is sensitive to outliers, including the log transformation instead of value Q would potentially remove heteroskedasticity and increase normality. However, testing the model for inclusion of log (Q) gives no qualitatively different results. We choose to maintain Q on a percentage form to be in line with most other previous studies.

In any application, due to data limitations or ignorance, there are factors we will not be able to include. In our models, the probability is very high that this is the case, since we do not have a strong theoretical foundation behind the choice of variables to explain firm performance. There are most likely both observable and unobservable factors, and it is therefore difficult to replicate the true model. If there is reason to believe that one or more omitted variables are correlated with our independent variables, then the above assumption will also fail and OLS will produce biased estimates. We will get back to this issue in the following chapters on fixed-effects model and instrument variable estimation.

5.5.5 Concluding remarks on pooled OLS regressions

Using a pooled OLS model on quarterly data from 2001-2007 we find that concentration is significant and negative for firm performance, measured by Tobin's Q. Our models are comparable to the models by Bøhren and Ødegaard (2001), which have the same conclusion when looking on the period 1989-1997. However, when including controls for aggregate ownership, our results differ from Bøhren and Ødegaard. We find that international ownership is associated with higher values of Tobin's Q, while government ownership is associated with lower values of Tobin's Q. There is also an indication that individual ownership can be positive. Correcting for possible panel-level heteroskedasticity and autocorrelation, we find that the significance of our results is affected. Still, concentration is negative on a 95% level. Aggregate government ownership is negative compared to all other owner sectors, significant on a 99% level compared to non-financial and international ownership, and 95% level compared to individual ownership. Aggregate international ownership is positive compared to all other owner groups, and significant on a 99% level compared to non-financial and government owners. However, we do not see a clear conclusion for aggregate individual ownership.

When using a pooled OLS model, the most important assumption is the exogeneity assumption. If the model is mis-specified or suffers by omitted variables that are correlated with our explanatory variables, the method will produce biased results. We will explore solutions to this problem in the following chapters.

5.6 Fixed-effects model

5.6.1 Arguments for using a fixed-effects model

Himmelberg et al. (1999), studying the relationship between managerial shareholdings and firm performance, emphasize the importance of unobserved heterogeneity in the firm's contracting environment. They argue that low levels of managerial shareholdings might not necessarily be an evidence of a suboptimal incentive arrangement for a particular firm if, for instance, the firm's scope for moral hazard tends to be low. They also find that a large share of the cross-sectional variation in managerial ownership is "explained" by unobserved firm heterogeneity. They argue that this unobserved heterogeneity creates a spurious correlation between ownership structure and performance.

Himmelberg et al. (1999) argue that the use of a standard OLS approach, regressing a performance measure such as Tobin's Q on variables such as percentage of equity held by managers, is potentially mis-specified because of the presence of unobserved heterogeneity. If some of the determinants of Tobin's Q are also determinants of managerial shareholdings, then managerial ownership might spuriously appear to be a determinant of firm performance.

They provide three examples of likely sources of unobserved heterogeneity, and discuss the econometrical implications of each on cross-sectional regressions. First, they give an example of a company with superior access to monitoring technology vs. another comparable company without access to the same technology. The degree of monitoring will affect the need for managerial ownership to align incentives, and hence excluding this variable from the model specification will potentially lead to spurious relationships. Second, they mention intangible assets as an example of unobserved firm heterogeneity. Given that intangible assets are more difficult to monitor, and hence subject to managerial discretion, the owners of a company with higher levels of intangible assets will require a higher level of managerial ownership to align incentives. Moreover, the presence of intangible assets will also affect the Q measure, since intangibles are valued by the market in the nominator, but understated in the denominator. The third example of unobserved heterogeneity, which we discuss in our section describing industry sectors, is varying degree of market power. If a company is faced with a high degree of market power, maybe for some historical reason, this market power might insulate the disciplining mechanisms of the competitive product market from managerial decision-making. Hence, stronger incentive contracts will be needed.

Himmelberg et al. (1999) argue that in the presence of uncontrolled-for or unobserved firm characteristics, assuming that these effects are constant over time allows us to use panel data with a fixed-effects estimator.

5.6.2 Fixed-effects estimation – in theory

We start by giving a general example of the fixed effects transformation for a simple equation, before we specify our own model. The following example is motivated by Wooldridge (2006) to describe the fixed-effects transformation:

The starting point is an equation with a single explanatory variable:

$$y_{it} = \beta_1 x_{it} + a_i + u_{it}, t = 1,2 \dots T$$

If we average this equation over time, we get:

$$\bar{y}_i = \beta_1 \bar{x}_i + a_i + \bar{u}_i$$

Here $\bar{y}_{it} = T^{-1} \sum_{t=1}^{T} y_{it}$, and so on. Since a is constant over time (we assume), it appears in both equations. Hence, subtracting the last from the first equation, we end up with:

$$\ddot{y}_{it} = \beta_1 \ddot{x}_{it} + \ddot{u}_{it}, t = 1,2 \dots T$$

Here, $\ddot{y}_{it} = y_{it} - \bar{y}_i$ is the time-demeaned data on y. The important thing about the last equation, is that the unobserved effect, a, has disappeared. If we believe that the unobserved effect is constant over time, this suggests that we should estimate this equation by a pooled OLS model based on the time-demeaning variables. This is called the fixed-effects estimator or the within transformation.

5.6.3 Fixed-effects model with an unbalanced panel

According to Wooldridge (2006), fixed-effects models with unbalanced datasets are not much more difficult to estimate than fixed effects with balanced datasets. If T_i is the number of time periods for cross-sectional unit i, we simply use these T_i observations in doing the time-demeaning. The total number of observations is then $T_1 + T_2 + T_3 + \dots + T_N$. As in the balanced case, one degree of freedom is lost for every cross-sectional observation due to the time-demeaning. We use STATA to run the fixed-effects model, and STATA makes the appropriate adjustments for this loss.

According to Wooldridge, if the reason why a company leaves the sample is correlated with the idiosyncratic error (the unobserved factors that change over time and affect profits), then the resulting sample section problem can cause serious biased estimators. However, a useful thing about using a fixed-effects analysis is that it *does* allow for correlation between attrition and a_i, the unobserved effect.

Solving general attrition problems in panel data sets is very complicated, and beyond the scope of our analysis.

5.6.4 Fixed-effects model on ownership concentration

We run a fixed-effects model based on the base case pooled OLS model, where we use percentage of shares owned by the 5 largest owners as concentration measure, and control for size and volatility. Since we use fixed-effects estimation, we choose to exclude the sector variables. It can be argued that this effect should be absorbed by the fixed effect. Moreover, since the fixed-effect model uses deviations from the mean at each point in time, a sector dummy variable does not have a meaningful interpretation.

Table 19: Fixed-effects regression on ownership concentration

```
-----------------------------
DEPENDENT VARIABLE        Q
-----------------------------
LOGL5                 0.015
                     (0.13)

LOGVALUE            0.728***
                    (18.97)

SDRETURN              0.006
                     (0.60)

_cons              -8.391***
                    (-10.50)
-----------------------------
r2                    0.113
r2_a                  0.049
N                  3052.000
-----------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
```

From Table 19 we see that ownership concentration has a positive coefficient, but has lost significance. We have no study of comparison using fixed-effects to study the relationship between ownership concentration and firm performance, but Himmelberg et al. (1999) find that insider holdings fail to explain Tobin's Q in a similar regression.

Experimenting with different time periods, we find that the coefficient of concentration gets positive and significant on a 95% level in the period 2001-2005 and negative and significant on a 99% level from 2006-2007 (For regression results, see Table 29 in appendix 6). This might explain why the coefficient for the whole period is insignificant. However, we have no theoretical explanation why concentration should be positive for the first years and negative for the last years. This might indicate that this model is not well suited.

5.6.5 Fixed-effects model on owner identity

5.6.5.1 By aggregate ownership

In this section we repeat the same models as we do in section 5.5.3.1, but in a fixed-effects framework. First, we run a regression where we include the aggregate holdings of the different owner sectors as control variables, excluding the variable for financial institution, to use this owner group as reference. The other controls are debt/asset ratio and size.

Table 20: Fixed-effects with financial owners as reference

```
----------------------------
DEPENDENT VARIABLE:      Q
----------------------------
LOGL5                 0.161
                     (1.24)

ID_ACC_GOV          -1.279
                    (-1.06)

ID_ACC_IND           1.678***
                     (4.06)

ID_ACC_INT           1.271***
                     (3.18)

ID_ACC_NFI           0.194
                     (0.49)

DEBTASSETS           0.088
                     (0.54)

LOGVALUE             0.734***
                    (17.06)

_cons               -8.410***
                    (-9.02)
----------------------------
r2                   0.126
r2_a                 0.061
N                 3052.000
----------------------------
t statistics in parentheses
* p<0.10,** p<0.05,*** p<0.01
```

From Table 20 we see that concentration is positive but insignificant when including the aggregate holdings by different owner sectors. Compared to what we found in a pooled OLS model, the significance is stronger for individual and international ownership in a fixed-effects framework. Both are positive and significant on a 99% level compared to financial ownership. Government ownership is negative, but not significant compared to financial ownership. Non-financial ownership is positive, but not significant compared to financial ownership.

Table 21: Fixed-effects by aggregate ownership - summary

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		-	-***	+	-***
Non-fin	+		-***	+	-***
International	+***	+***		+**	-
Government	-	-	-**		-**
Individual	+***	+***	+	+***	

`* p<0.10, ** p<0.05, *** p<0.01`

Table 21 provides strong support for the findings in a pooled OLS framework, especially that aggregate individual ownership and aggregate international ownership are associated with higher values of Tobin's Q compared to all other owner sectors except between the two, where the different is insignificant. Aggregate government ownership is still negative, but only significant relative to individual and international ownership.

5.6.5.2 By identity of largest owner

We repeat the calculations in Table 17, but in a fixed-effects framework. We include dummy variables that equal unity if the largest owner is non-financial, international, government or individual. We continue to exclude the dummy variable for financial ownership, which is used as reference.

Table 22: Fixed-effects by identity of largest owner

```
----------------------------
DEPENDENT VARIABLE:        Q
----------------------------
LOGL5                  0.027
                      (0.22)

ID_NFI                -0.173
                     (-1.33)

ID_INT                 0.018
                      (0.13)

ID_GOV              -0.450**
                     (-2.20)

ID_IND                 0.091
                      (0.57)

DEBTASSETS             0.168
                      (1.03)

LOGVALUE            0.722***
                     (18.59)

_cons              -8.197***
                     (-9.97)
----------------------------
r2                     0.118
r2_a                   0.052
N                   3052.000
----------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
```

In Table 22 we see that the identity effect is most significant for government ownership, measured by the identity of the largest owner. The coefficient is negative and significant on a 95% level. The coefficients for individual and international ownership are still positive, but insignificant relative to financial ownership. Non-financial ownership is negative and insignificant, and changes sign compared to the previous model using aggregate ownership.

Table 23 shows that aggregate government ownership is more significant when measured by the identity of the largest owner. The coefficient is negative compared to all other owner identities and significant for three out of four. International ownership is still positive and significant at a 95% level compared to non-financial ownership and significant on a 99% level compared to government ownership. Individual ownership is positive and significant on a 95% level compared to non-financial ownership and on a 99% level compared to government ownership.

Table 23: Fixed-effects by largest owner - summary

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		+	-	+**	-
Non-fin	-		-**	+	-**
International	+	+**		+***	-
Government	-**	-	-***		-***
Individual	+	+**	+	+***	

`* p<0.10, ** p<0.05, *** p<0.01`

5.6.6 Discussion of results and econometric issues

The fixed-effects approach provides less clear results on the effect of ownership concentration than the pooled OLS model. Firstly, concentration is not significant in either a positive or negative direction, except when measured in certain sub-periods. However, the sign is reversed for two different time periods, which gives no clear conclusion.

The effect of owner sector is however comparable to what we found in a pooled OLS framework, and generally more significant. We still find support for a positive and significant effect of aggregate individual and international ownership, even though the significance varies between the two approaches of measuring owner identity. Government ownership has negative coefficients for both models, and slightly more significance when measuring identity by the largest owner.

There are three important factors which should be remembered. Firstly, a general concern when using a fixed-effects model should be the greater potential for measurement errors. Since we do not operate with level-data, but rather deviations from the mean, measurement errors will influence the results to a larger extent.

Secondly, if we do not have a sufficient variation in the variables over time, the fixed-effects model will not produce good results. As we have seen in section 4.1.4, the changes in ownership concentration over time has been relatively low for the companies listed on the Oslo Stock Exchange in general during the period, except from the past two years. However,

the change in owner identity has been considerable. This might explain why we find a stronger identity effect than concentration effect.

Thirdly, the model assumes that the unobserved heterogeneity is constant over the period. If this is not the case – if firm characteristics are not constant over time, for instance due to industrial, managerial or financial restructurings – then this model will not produce correct estimates.

Moreover, the fixed-effects model has been accused for being misleading. Zhou (2001) argued that the approach may not allow detecting an effect of ownership on performance even if it existed.

5.6.7 Concluding remarks on fixed-effects regressions

Using a fixed effects model, we assume that the unobserved heterogeneity affecting firm performance is constant over time, and hence treat it as fixed and remove it from the calculations. Similar to other papers (Himmelberg et al., 1999; Grosfeld, 2006) we find insignificant coefficients for ownership concentration. However, our tests for owner sector provide qualitatively comparable results to the pooled OLS approach. International and individual ownership show positive and significant coefficients, while government ownership still shows negative coefficients compared to all other owner sectors.

5.7 Instrument variables estimation

5.7.1 Instrumental variables estimation in theory

We started in a pooled OLS framework, and continued with a fixed-effects framework, assuming that we are dealing with an unobserved effect which is constant over time. However, if we are interested in solving the problem with time-varying omitted variables that are correlated with the explanatory variables, the previous method will not be well suited. In addition, the fixed-effects method does us little good if we are interested in the effect of a time-constant explanatory variable, since it eliminates variables that do not change over time.

According to Wooldridge (2006), the method of instrument variables (IV), when used properly, is a method that can allow us to estimate ceteris paribus effects in the presence of

endogenous explanatory variables. It is an estimation model that leaves the unobserved variable in the error term, and recognizes the presence of the omitted variable.

The basic idea behind instrumental variables is that one (or more) of the explanatory variables are correlated with the error term (u). Given the following model (Wooldridge, 2006):

$$y = \beta_0 + \beta_1 x + u$$

where cov(x,u) $\neq$ 0, we can decompose the x into two components $x = [\pi_0 + \pi_1 z] + v$

The expression in the brackets might be predicted by an instrumental variable, z, while the last part, v, is potentially correlated with u. An instrumental variable z for the endogenous variable x has two important properties:

1) Cov(z,u) = 0, meaning that z should not be correlated with the error term, u.
2) Cov(z,x) $\neq$ 0, meaning that z should be correlated with x, the variable we are trying to instrument

Using an instrumental variable, we can leave the non-exogenous part out of the equation and work our way around the endogeneity problem. It should be emphasized that if instruments are poor, meaning a violation of (1) or (2) above, or both, 2SLS might be worse than OLS (Wooldridge, 2006).

5.7.2 Choosing instrument variable for ownership concentration

A suitable instrument for ownership concentration should be one that is correlated with ownership concentration, but not correlated with the omitted variable which is correlated with Tobin's Q. As several authors argue, including Demsetz and Villalonga (2001), Himmelberg et al. (1999) and Bøhren and Ødegaard (2001), there is a lack of theoretical foundation regarding the choice of instruments. This is a problem, since we have to use common sense and economic theory to decide if it makes sense to assume that Cov(z,u)=0. However, we can test if Cov(z,x) $\neq$ 0, doing a simple regression on the instrument variable, z, as explanatory variable for the endogenous variable x. Bøhren and Ødegaard (2001) argue that a general problem around the discussion of instruments is not explaining why an exogenous variable drives one endogenous variable, but rather why this variable is irrelevant for all the others.

In this section we will discuss a selection of instruments used in previous research. We will discuss whether we econometrically and theoretically can argue that the instruments are correlated with the endogenous variable, and whether we theoretically can argue that the instruments are uncorrelated with our dependent variable, Tobin's Q. In the following section we will use the different instruments in two-stage least squares regressions to study the effect of using the different instruments.

5.7.2.1 Using stock volatility as instrument

A first-stage regression using stock volatility and its squared term as explanatory variables for ownership concentration (LOGL5) gives a p-value of 0,018 for standard deviation and 0,099 for its squared term. Clearly, $Cov(z,x) \neq 0$, and assumption 1 is not violated.

Demsetz and Lehn (1985) hypothesize that increased variability in the firm's environment creates stronger incentives for outsiders to monitor closely because management quality matters more in risky environments. They therefore suggest that variability of stock return might be a candidate, and also include the squared term to allow for non-linearity. What is hard, however, is to argue why the control potential is not reflected in the value of the firm, and hence in Q. We therefore cannot convincingly argue that $Cov(z,u) = 0$.

Himmelberg et al. (1999) also argue that stock price volatility is an acceptable, but not perfect, instrument for ownership structure; and that other potential candidates probably are worse because they may also affect Tobin's Q.

5.7.2.2 Using stock turnover as instrument

A first-stage regression using liquidity (operationalized as stock turnover) as explanatory variable for ownership concentration (LOGL5) gives a p-value of 0,000. Clearly, $Cov(z,x) \neq 0$, and assumption 1 is not violated.

According to Bøhren and Ødegaard (2001), liquidity can be considered as an instrument for ownership concentration. The rationale is based on the fact that the investment horizon (holding period) is longer for larger owners than for others, since market microstructure theory argues that there is an extra cost to selling large blocks due to price pressure. Hence, large owners may hesitate more than others in liquidating a position. If larger holdings tend to be on longer term, a smaller fraction of the firm's equity will be available for trading in a highly concentrated firm. Therefore, according to Bøhren and Ødegaard (2001), as the free float is lower, equity turnover will be smaller.

However, as we have previously argued, liquidity is found to be a systematic factor explaining returns on the Oslo Stock Exchange. Næs et al. (2007) find that one should expect excess returns from the risk of holding stocks with low liquidity. Therefore, we might question the quality of this instrument.

5.7.2.3 Using debt-to-equity ratio as instrument

A first-stage regression using debt/equity ratio as explanatory variable for ownership concentration (LOGL5) gives a p-value of 0,006. Clearly, $Cov(z,x) \neq 0$, and assumption 1 is not violated.

Omran et al. (2008) use debt-to-equity ratio as an instrument, referring to the possibility that creditors might be able to minimize the managerial agency costs and in the process affect ownership concentration. Again, it is hard to argue that debt-to-equity ratio is unrelated to the value of Tobin's Q. One of the earliest studies on capital structure was done by Modigliani and Miller (1958). They suggest that in a world with perfect capital markets capital structure should be unrelated to firm value, but in a world with tax-deductable interest payments, firm value and capital structure are related. The relationship between capital structure and firm value has since been the subject of a considerable debate in the corporate finance literature. Without going more deeply into this discussion, we conclude that we have no convincing argument to support that firm value is unrelated to capital structure; hence we can question the quality of debt-to-equity ratio as an instrument.

5.7.2.4 Using a combination of instruments

Pedersen and Thomsen (2003) build on the research by Demsetz and Lehn (1985) and use standard deviation of ROE as instrument. They also include the squared term to allow for non-linearity. In addition, they use assets and average concentration by industry as instrument variables.

A first-stage regression using the variables specified by Pedersen and Thomsen (2003) as explanatory variables for ownership concentration (LOGL5) gives a p-value of 0,000 for all variables. Clearly, $Cov(z,x) \neq 0$, and assumption 1 is not violated.

We have already argued that volatility (here measured by standard deviation of ROE) might be a suitable, but not perfect instrument for Q. What is hard, however, is to argue why the control potential is not reflected in the value of the firm, and hence in Q. We have already seen that firm value is positively correlated with Tobin's Q, which suggests that also the

level of assets is correlated with Tobin's Q. Lastly, the industry mean concentration should be a good indicator of the concentration for a firm in that particular industry. If we believe that the degree of market competition varies between industries, the control potential should also vary between different industries. Hence, it can be argued that the need for outside monitoring will vary. However, we have previously argued, and showed empirically, that Tobin's Q varies between industries. Hence, we can question the quality of industry mean concentration as an instrument.

5.7.3 2SLS on ownership concentration

In this section we run three different two-stage least squares (2SLS) regressions using different instruments for ownership concentration[25]. The first is motivated by Demsetz and Lehn (1985), and we instrument ownership concentration using stock volatility and its squared term. The second model is motivated by Bøhren and Ødegaard (2001), who argue that stock turnover can be considered as an instrument. The third is motivated by Pedersen and Thomsen (2003). They use stock volatility, book value of assets and average industry concentration as instruments.

From Table 24 we can see that the significance of the coefficient of ownership concentration is very dependent on the choice of instrument. However, the coefficient is negative in all models. Using stock volatility as an instrument, the coefficient is negative, but insignificant. Using stock turnover as instrument, concentration is negative and significant on a 95% level. When a combination of instruments is used, the coefficient is negative and significant on a 95% level.

The other controls behave as expected. Firm size is positive and significant on a 99% level for all models, and capital structure is positive but insignificant. The sector variables behave similarly for all three models.

A Hausman test, testing whether the difference in coefficients between a 2SLS and OLS model of the same specification is systematic, gives a p-value near 0 for all models. That means we can reject the hypothesis of no systematic difference between the two methods. The consequence of rejecting the null hypothesis in the Hausman test is that OLS is

---

[25] We do not include debt-to-equity ratio as instrument, as it failed to provide meaningful results

inconsistent. 2SLS will be consistent in either case, but when we cannot reject the null hypothesis of non-systematic differences, OLS will be the appropriate model. This supports the hypothesis of endogeneity in the relationship between ownership concentration and firm performance, and thus supports the use of 2SLS compared to OLS.

Table 24: 2SLS using different instruments for ownership concentration

```
-----------------------------------------------------------
                       (1)            (2)            (3)
DEPENDENT VARIABLE      Q              Q              Q
-----------------------------------------------------------
LOGL5                 -0.985        -2.331***      -1.601**
                      (-0.35)        (-2.69)        (-2.10)

LOGVALUE               0.538***       0.511***       0.528***
                      (11.19)        (14.05)        (15.00)

DEBTASSETS             0.107          0.027          0.072
                      (0.49)         (0.16)         (0.45)

SEC_COD                1.142***       1.061***       1.117***
                      (2.87)         (2.64)         (2.82)

SEC_ENE                0.164          0.116          0.147
                      (0.46)         (0.32)         (0.41)

SEC_HCA                3.617***       3.072***       3.367***
                      (3.00)         (5.71)         (6.63)

SEC_IND                0.680*         0.647*         0.666*
                      (1.89)         (1.77)         (1.84)

SEC_ITE                2.026**        1.560***       1.823***
                      (2.09)         (3.37)         (4.17)

SEC_MAT                0.960*         1.076**        1.032**
                      (1.67)         (2.32)         (2.27)

SEC_TEL                0.636          0.324          0.506
                      (0.76)         (0.48)         (0.77)

SEC_UTI                0.731          1.091          0.899
                      (0.52)         (0.89)         (0.74)

_cons                -12.045        -18.549***     -15.066***
                      (-0.87)        (-4.26)        (-3.94)
-----------------------------------------------------------
N                     3052.000       3052.000       3052.000
Hausman p-value       0.0000         0.0001         0.0000
R-sq overall          0.1321         0.1089         0.1241
-----------------------------------------------------------
t statistics in parentheses  * p<0.10, ** p<0.05, *** p<0.01
(1) Volatility is used to instrument concentration (LOGL5)
(2) Liquidity is used to instrument concentration (LOGL5)
(3) Volatility, size and industry mean are used to instrument
concentration (LOGL5)
```

5.7.4 2SLS on owner identity

As we have done for the pooled OLS and fixed-effect frameworks, we extend the regressions of Tobin's Q on a proxy for concentration + controls by adding variables for owner identity. First, we add the aggregate holdings of the different owner sectors as control variables, excluding the variable for financial institutions, to use this owner group as reference. Second, we instead add dummy variables for each owner group, which equal unity if the largest owner belongs to the current owner group, using financial ownership as reference groups. We do both approaches using the three different instruments from the section above.

Table 25 shows that including control variables for aggregate owner sector holdings increases the overall explained variation of the model, while the coefficient for concentration (LOGL5) becomes less significant. The effect is not as pronounced as in the OLS framework. Still, the results indicate that adding control variables for aggregate ownership is relevant information to the model, and that some of this effect was earlier captured by the coefficient of concentration.

We see that while the majority of coefficients for aggregate ownership have the same sign independent of instrument used for ownership concentration, the degree of significance varies. We see the same tendency for the other significant variables in the model. Compared to financial ownership, non-financial ownership is positive, and significant in one model. International ownership is positive, and highly significant in two models. Individual ownership is also positive, and significant for all three models. Government ownership, however, is negative for two models and positive for one, none of which are significant.

Table 26 shows that adding control variables for the identity of the largest owner does not interfere with the significance of ownership concentration. This is as expected, since we add a dummy variable, instead of a variable measuring aggregate owner share. We observe that compared to financial ownership, non-financial ownership is positive, but insignificant for all models. International ownership is positive for all models, and significant for two. Individual ownership is also positive for all models and significant for two. Government ownership is negative, and significant for one model.

Table 25: 2SLS on owner identity - measured by aggregate holdings

```
------------------------------------------------------------
                        (1)            (2)            (3)
DEPENDENT VARIABLE      Q              Q              Q
------------------------------------------------------------
LOGL5                 -1.415         -2.874**       -1.022
                      (-0.32)        (-2.16)        (-1.04)

LOGVALUE               0.539**        0.447***       0.555***
                      (2.24)         (5.39)         (8.46)

DEBTASSETS             0.026         -0.012          0.032
                      (0.14)         (-0.07)        (0.21)

SEC_COD                1.136***       1.106***       1.101***
                      (2.74)         (2.69)         (2.83)

SEC_ENE               -0.024         -0.052         -0.036
                      (-0.07)        (-0.14)        (-0.10)

SEC_HCA                3.454***       3.107***       3.547***
                      (3.03)         (5.90)         (7.68)

SEC_IND                0.653*         0.630*         0.648*
                      (1.80)         (1.69)         (1.84)

SEC_ITE                1.888*         1.531***       1.954***
                      (1.90)         (3.23)         (4.73)

SEC_MAT                0.926          0.954**        0.855*
                      (1.57)         (2.02)         (1.93)

SEC_TEL                0.776          0.314          0.856
                      (0.57)         (0.41)         (1.24)

SEC_UTI                0.823          1.226          0.695
                      (0.46)         (0.96)         (0.58)

ID_ACC_GOV            -1.096          0.818         -1.590
                      (-0.19)        (0.44)         (-1.10)

ID_ACC_IND             1.435**        1.273***       1.473***
                      (2.35)         (2.85)         (3.63)

ID_ACC_INT             2.242          3.207***       1.980***
                      (0.77)         (3.31)         (2.64)

ID_ACC_NFI             1.723          3.042**        1.382
                      (0.44)         (2.44)         (1.47)

_cons                -15.603        -22.597***     -13.572***
                      (-0.72)        (-3.42)        (-2.78)
------------------------------------------------------------
R-sq overall           0.1528         0.1150         0.1624
N                   3052.000       3052.000       3052.000
------------------------------------------------------------
t statistics in parentheses  * p<0.10, ** p<0.05, *** p<0.01
(1) Volatility is used to instrument concentration (LOGL5)
(2) Liquidity is used to instrument concentration (LOGL5)
(3) Volatility, size and industry mean are used to instrument
concentration (LOGL5)
```

Table 26: 2SLS on owner identity - by identity of largest owner

```
-----------------------------------------------------------
                         (1)             (2)             (3)
DEPENDENT VARIABLE        Q               Q               Q
-----------------------------------------------------------
LOGL5                  -0.967          -2.360***       -1.634**
                       (-0.35)         (-2.67)         (-2.12)

LOGVALUE                0.551***        0.522***        0.541***
                       (10.72)         (13.95)         (14.93)

DEBTASSETS              0.075          -0.013           0.036
                       (0.34)          (-0.08)         (0.22)

SEC_COD                 1.150***        1.095***        1.145***
                       (2.95)          (2.74)          (2.88)

SEC_ENE                 0.132           0.075           0.114
                       (0.37)          (0.21)          (0.32)

SEC_HCA                 3.575***        3.013***        3.304***
                       (3.03)          (5.56)          (6.46)

SEC_IND                 0.689*          0.646*          0.671*
                       (1.90)          (1.77)          (1.85)

SEC_ITE                 2.026**         1.566***        1.822***
                       (2.22)          (3.42)          (4.20)

SEC_MAT                 0.950*          1.069**         1.039**
                       (1.67)          (2.31)          (2.28)

SEC_TEL                 0.777           0.468           0.651
                       (0.95)          (0.69)          (0.98)

SEC_UTI                 0.735           1.182           0.957
                       (0.50)          (0.96)          (0.78)

ID_GOV                 -0.528          -0.334          -0.431*
                       (-1.19)         (-1.38)         (-1.89)

ID_IND                  0.254           0.495**         0.366*
                       (0.52)          (2.21)          (1.78)

ID_INT                  0.207           0.467**         0.331*
                       (0.39)          (2.13)          (1.65)

ID_NFI                  0.048           0.319           0.176
                       (0.09)          (1.47)          (0.90)

_cons                 -12.167         -19.126***      -15.574***
                       (-0.87)         (-4.18)         (-3.91)
-----------------------------------------------------------
R-sq overall            0.1469          0.1185          0.1358
N                    3052.000        3052.000        3052.000
-----------------------------------------------------------
t statistics in parentheses  * p<0.10, ** p<0.05, *** p<0.01
(1) Volatility is used to instrument concentration (LOGL5)
(2) Liquidity is used to instrument concentration (LOGL5)
(3) Volatility, size and industry mean are used to
instrument concentration (LOGL5)
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We repeat the calculations in Table 25 and Table 26 using every owner sector as a reference group; hence we do the same regression for every instrument and based on every owner sector as reference. Detailed results can be found in appendix 6 (Table 30, Table 31, Table 32, Table 33, Table 34, and Table 35). The main findings are as follows:

- International ownership has positive coefficients compared to all other reference groups when identity is measured by aggregate ownership. When identity is measured by the largest owner, the effects are the same, although not clear compared to individual ownership.

- Government ownership has negative coefficients for all models and instruments, except from a single observation when share turnover is used as instrument and aggregate holdings are used to measure identity. The negative effect of government ownership is generally more pronounced when measuring identity by the largest owner.

- Individual ownership is always positive, and often significant, compared to financial ownership and government ownership. When ownership is measured by aggregate ownership, the effect is positive compared to international ownership. The opposite is true when ownership is measured by the largest owner.

- Financial ownership is negative compared to most owner groups, except government, independent of how identity is measured.

- Non-financial ownership is negative compared to international ownership and positive compared to financial and government ownership for all models.

For all the effects described above, the degree of significance varies by choice of measurement of identity and by the use of instrument for ownership concentration.

5.7.5 Discussion and econometric issues

We started by describing the properties of instrument variable regressions, and how the previous research has failed to find one or more instrument(s) which convincingly can be argued being correlated with ownership concentration and uncorrelated with Tobin's Q. We choose three variations of instrument definitions, based on previous research, and find that the coefficient of ownership concentration is negative for all instruments. Moreover, a Hausman tests suggest that the method of instrument variable might be consistent, while OLS is inconsistent, for our model specifications.

We should be careful drawing strong conclusions based on these results. As we already have mentioned, using 2SLS with poor instruments can give worse results than OLS. Using stock volatility, the instrument argued in past research to be the most precise, albeit not perfect, gives no significant results. Therefore, it is difficult to know whether the significance from using the two other instruments is due to instrument weaknesses or due to a real negative effect of ownership concentration.

We measure the effect of owner identity using the same approach as for pooled OLS and fixed-effects. We find that the significance of identity effects is affected by the choice of instrument for ownership concentration. Still, our overall findings seem to support the conclusions from the previous model scenarios. Government ownership is associated with negative performance, and international ownership with positive performance, compared to other owner sectors. The effects for government ownership are stronger when using largest owner as measure of identity.

6. Results and discussions

In this paper we have empirically examined the relationship between ownership structure and firm performance, treating ownership concentration and owner identity as separate, but dependent dimensions of ownership structure. By utilizing a large and accurate sample of quarterly data from non-financial companies at the Oslo Stock Exchange in the period 2001-2007, we provide new evidence on the relationship between ownership structure and firm performance.

6.1 Ownership concentration

Using OLS, we find that ownership concentration is significantly and negatively related to firm performance, measured by Tobin's Q. These results are similar to the findings by Bøhren and Ødegaard (2001), studying non-financial firms on the Oslo Stock Exchange in the period 1989-1997. However, when controlling for fixed firm effects, motivated by Himmelberg et al. (1999), we find no significant relationship. Using the method of instrument variables (two-stage least squares) to account for endogeneity of ownership structure, we find negative coefficients for ownership concentration. However, we also find that the choice of instrument highly affects the significance of our results. Using stock price volatility as instrument for firm performance, which has been argued by Demsetz and Lehn (1985) and Himmelberg et al. (1999) to be a suitable, albeit not perfect instrument, we do not find a significant effect of ownership concentration on firm performance. We believe 2SLS to be the most appropriate of these models, since existing research shows that consensus has emerged around treating ownership concentration as endogenous in relation to firm performance. However, we suspect the results from using instrument variables to be driven by weak instruments, and can therefore not conclude (econometrically) that ownership concentration influences firm performance.

Several papers using the method of instrument variables (Loderer and Martin, 1997; Cho, 1998; Himmelberg et al., 1999; Demsetz and Villalonga, 2001) find the effect of ownership structure to be insignificant. One common explanation for this result is the equilibrium hypothesis formulated by Demsetz (1983). It implies that the market succeeds in bringing forth ownership structures, diffuse or concentrated, which are appropriate for the respective

firms. These structures differ across firms because of differences in the environment facing firms, especially with regard to scale economies, regulation, and the stability of the environment in which they operate. Therefore, Demsetz (1983) expects to find no relationship between ownership concentration and firm performance.

Bøhren and Ødegaard (2001) suggest another explanation for the lack of significance. They argue that weak instruments might drive the results, and that the lack of theory about the relationship between ownership structure and performance currently limits the relevance of more advanced econometrics. The implication of this argument is that lack of significance not necessarily should be thought of as a support for the equilibrium hypothesis. We end up with a somewhat similar conclusion, suggesting that more credible instruments are needed, than the ones used in this paper, to increase the validity of using instrument variables to investigate the relationship between ownership structure and firm performance.

Robustness tests show that our results are insensitive to the choice of concentration measure but sensitive to the choice of performance measure. We find that by using accounting measures we are not able to get significant results in pooled OLS models, in line with the results from using the market measure Tobin's Q. However, we have argued that if market players have an opinion about the effect of ownership structure, and hence adjust share prices instantly after an unanticipated change in ownership structure, quarterly data would be more precise than annual data using a market based performance measure. Therefore we believe that using a market based performance measure with quarterly data could increase the precision of our models compared to previous studies.

6.2 Owner identity

We argued in section 2.3.3 that individual, financial, non-financial, international, and government owners differ in terms of wealth, cost of capital, competence, preferences for perks consumption and their non-ownership related ties to the firm. Therefore, different owners might have different approaches to the way they exercise the owner role, which in turn might influence firm performance.

Our approach to investigating this effect is to extend the regressions of ownership concentration on firm performance by including control variables for owner identity. We include two sets of control variables in separate regressions to investigate both the effect of

aggregate shareholdings by an owner sector and the effect of the identity of the largest owner. These are two proxies capturing different dimensions of owner identity. However, we find that the two ways of accounting for owner identity to a large degree provide the same results and interpretations for owner identity.

Since we measure owner identity and ownership concentration as separate, but dependent dimensions of ownership concentration, we investigate the effect of owner identity in all the three different econometric approaches used to investigate the effect of ownership concentration. We find that the effect of owner identity seems consistent irrespective of econometric approach to model ownership concentration.

From our above definitions of owner identity, our results suggest that government ownership is negatively related to firm performance. Specifically, when the government is holding large fractions of stock, or the government is the largest shareholder, the effect on firm performance is negative relative to other owner sectors. This effect is consistent through all econometric methods, and is particularly pronounced when the government is the largest shareholder.

The effect of international owners, however, seems positive. Compared to financial, non-financial and government ownership, large holdings by international investors or having an international owner as the largest owner, is associated with positive effect on firm performance. For a majority of calculations the effect is positive also compared to individual investors, but since the effect is rarely significant, and occasionally with a negative sign, we choose to define it as unclear.

Individual ownership is positive for all models compared to financial institutional and government ownership. The effect relative to non-financial ownership is unclear. One explanation for this might be rooted in the classification of owners as individual or non-financial. Behind some of the companies located in the non-financial category there might be large individual investors. Even though we in our dataset have grouped likely candidates for private investment companies in the individual category, some individual investors might still be left in the non-financial sector. This might make the differences between these sectors less clear.

Non-financial institutional ownership shows no clear results, except from being negative compared to international and positive compared to government ownership. Financial

institutional ownership is negative relative to individual and international ownership, but positive relative to government ownership. In general, we find no evidence to argue against the conclusion by Bøhren and Ødegaard (2001), stating, "Direct ownership is superior to investing through intermediaries like institutions and the state".

Table 27 shows a summary of our findings on owner identity. It should be interpreted as follows: for the observations given a positive (+) or negative (-) sign, the effects of owner identity have been consistent for all the approaches and all instruments used, irrespective of how we measure identity. Unclear effects are denoted with a question sign (?).

Table 27: Summary table of results on owner identity

	Financial as reference	Non-financial as reference	International as reference	Government as reference	Individual as reference
Financial		?	-	+	-
Non-financial	?		-	+	?
International	+	+		+	?
Government	-	-	-		-
Individual	+	?	?	+	

Our thorough description of results from different models in section 5 shows strong significance for identity effects in a majority of the models. However, the degree of significance seems to vary between the different models, and we are thus not able to conclude with one set of values for significance unless we have a reason to believe that one way of modeling is superior to the other. We do, however, find reasons to suggest that owner identity seems important in relation to firm performance, and that government ownership seems to be associated with weaker firm performance, while international ownership is associated with stronger firm performance.

What we also find interesting, is the fact that when we include the variables for aggregate ownership by different owner sectors in the pooled OLS model, we can remove the variable measuring general concentration (the ownership share by the 5 largest owners), and maintain the same degree of explained variation in the model. Consequently, it seems like the effect of concentration is absorbed in the identity variables. Since the variables for aggregate ownership are significant, some with a positive and some with a negative sign, this suggests

that the question whether ownership concentration is related to firm performance should include the dimension of owner identity.

In the following we discuss possible economic explanations behind our findings.

6.2.1 International ownership

Agency theory suggests that international investors would be reluctant to perform active corporate governance due to lack of country specific knowledge regarding law, regulation, competition, local investors and corporate strategy. Brennan and Cao (1997) argue, whilst information about domestic companies can be easily acquired, information about foreign companies requires considerably more effort and resources to acquire. Because of the additional information costs, foreign investors are at a disadvantage relative to domestic investors. Disclosure helps to reduce agency conflicts by bridging the information gap that exists between managers and shareholders and between the informed and uninformed investors (Healy and Palepu, 2001, Leuz and Verrecchia, 2000). Ahearne et al. (2004) document empirical evidence showing that US investors consider the cost of information gathering as an important factor against investing in foreign shares.

The reasons why foreign ownership can create value for domestic companies are related to "spillovers" (Hill, 2003). This includes capital in terms of financial, human and technology resources which foreign investors add through their investment. Alternative explanations for the positive effect of international ownership might lie in the development of the stock market itself. Following Brennan and Cao (1997), who argue that when domestic investors possess a cumulative information advantage over foreign investors about their domestic market, investors tend to purchase foreign assets in periods when the return on foreign assets is high and to sell when the return is low. In section 4 we presented key statistics of OSE, which illustrated that the period of 2001 – 2007 was characterized by a substantial increase in share prices and return combined with a steady increase in the level of foreign ownership. This suggests that the positive stock price development at OSE itself could potentially function as explanation for some of the effect of international ownership on Tobin's Q.

Summarizing the effect of international ownership, our results indicate that the positive effects of international ownership outweigh the increased agency costs from international ownership, related to distance, surveillance and access to information.

6.2.2 Government ownership

This study have solely focused on the shareholder perspective of ownership structures and its effect on the market based ratio Tobin's Q and does neither discuss, nor take a stand, on government ownership beyond explaining potential reasons the identity effect of government ownership have on Tobin's Q.

Reasons for government ownership are, among other, to ensure national control of extensive natural resources or ensure that the company's headquarters remain in Norway. With private, institutional or international ownership the government would risk control over national resources and hence it is not an alternative for the government to completely sell their stakes. The driver behind having partly privatized ownership is that politicians have become aware of the advantages to private operation. However, it might be argued that issues for other shareholders, facing large government ownership, emerge when politics and socio-economic factors are taken into consideration, and corporate decisions are made because of such reflections. With a controlling position the government could extract benefits for the state at the expense of the minority private shareholders. With changing parties in the political administration, with different political views, it could also be difficult for the government to act consequently and long term with its ownership stakes.

Our findings on government ownership support the hypothesis that the mixture of roles and incentives which are associated with government ownership is negatively related to firm performance.

6.2.3 Individual ownership

Our findings indicate no clear effect of individual ownership on firm performance relative to other owner groups. However, we see that concentrated individual ownership is positive compared to financial institutional ownership and government ownership. As discussed, the effect on non-financial institutional ownership is questionable, but might be a consequence of owner categorization. Hence, we do not find unanimous support for the positive effect of concentrated individual ownership. However, where we observe positive effects, they might well be explained in the agency context, primarily by the effect and incentive of monitoring directly when having a personal claim to the firm's cash flow, as opposed to institutional and government owners.

6.2.4 Financial institutional ownership

Our findings support the pre-defined hypothesis of no effect on firm performance from the level of financial institutional ownership. Alternative explanations that indicate a positive effect include competent financial institutions directing scarce capital to the most efficient usage. On the other hand, agency theory suggests that layers of agents between the true principal and the agent indicate poor incentives and hence a negative performance effect.

6.2.5 Non-financial institutional ownership

In the theoretical section we argued that non-financial block ownership is unique relative to financial-institutional or individual block ownership because of possible benefits in business relationships between target firms and non-financial owners. Alternative explanations for non-financial block ownership include alleviating financing constraints in target firms, or that purchasers possess information advantages, or are better or worse able to monitor the operations of target firms. On the other hand, as for financial institutions, layers of agents between the true principal and the agent indicate poor incentives and a negative performance effect.

We find that non-financial ownership is negative in relation to international ownership and positive in relation to government ownership, but find no significant effect in relation to individual and financial institutional ownership.

6.3 Limitations of our study

We have described the strengths and weaknesses behind our econometric approaches during the paper. In this section we will summarize what we find to be the most relevant limitations of our study.

First, no complete econometric approach or theory to describe the relationship between ownership structure and firm performance has yet been developed. Different econometric approaches have been suggested, which imply different views on the relationship between the variables. We have used three methods; an OLS model as the base case, a fixed-effect model assuming that firms are affected by an unobserved heterogeneity in the contracting environment, and 2SLS assuming that we can solve the endogeneity issue by using instrument variables. These are all methods suggested in the literature. However, these

methods do not account for a scenario where ownership concentration and firm performance are jointly determined. The method of simultaneous equations will be an alternative approach of investigating the relationship between ownership structure and firm performance in such a scenario. This method has been criticized, however, in the face of low quality instruments. Bøhren and Ødegaard (2001) argue that until an improved theory about the relationship between ownership structure and firm performance exists, this method might not provide much insight.

Second, the results on ownership structure could be biased since some owners could have spread their stock holdings on several closely related parties. This may result in shareholders having larger and more concentrated holdings than what appears in our data.

Third, the results on owner identity might be biased due to several reasons. First, the effect of owner identity is relatively unexplored. Hence, few theories have been developed to explain the relationship between owner identity and firm performance. It might well be that identity should be treated as an endogenous variable, or that there are other biases in our modeling not discovered by us or by the articles on which we base our approach. Simultaneity in this variable is also a possible scenario. We argued in section 6.2.1 that our findings of a positive effect of international ownership on Tobin's Q might possibly be explained by a positive development in the stock market. Hence, there is a possibility that Tobin's Q might explain parts of the variation in owner identity. Second, our categorization of owners into owner sectors may be inaccurate. For example, our classification of non-financial companies might include individual investors investing through limited companies. These could have been classified as individual according to our theoretical discussion. Moreover, our classification of international owners includes both individuals and companies. A more detailed division might have produced increased insights.

6.4 Suggestions for future research

Future research could go in several directions. Previous research mostly originates from US/UK. The institutional framework may create differences in how concentrated or dispersed the ownership structure is, as well as the level of investor protection for minority and majority shareholders. Therefore, more evidence from other countries would contribute to better understand the relationship between ownership structure and firm performance.

Research on owner identity is currently relatively limited. As we have described in section 6.3, our results might be biased due to categorization issues and underdeveloped theory regarding the relationship between owner identity and firm performance. Our study shows that owner identity is important. Hence, going deeper into the determinants of owner identity and firm performance would be an interesting subject for future research.

Since international investors constitute such a large fraction of the ownership at the Oslo Stock Exchange (OSE) it would be interesting to analyze different sub-identities within the international category and their effect on firm performance. Through a new service called Nominee ID, the Norwegian Central Securities Depository (VPS) now offers a product together with Richard Davies Investor Relations (RD:IR) where it is possible to discover the identity behind the nominee accounts. Moreover this service reveals investor information related to geographical origin, investment strategy and identity[26]. More knowledge behind international ownership at OSE opens for new research on the effect of international ownership on firm performance.

As discussed in section 6.3, the method of simultaneous equations has been utilized in recent research papers claiming that the source of endogeneity is that concentration and firm performance are jointly determined. The method also allows for the study of reverse causality between the variables. While this approach might allow for interesting insights, it has been criticized for producing spurious results faced with low quality instruments. Therefore, we leave it to future research to explore the use and validity of simultaneous equations.

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[26] Oslo Børs Nominee ID, < http://www.vps.no/public/For-selskaper/Produkter/Nominee-ID > (accessed 10. June 2009)

In an extended corporate governance project, several interesting approaches can be taken. Firstly, it could be interesting to analyze ownership structure when focusing on a specific sector, like the ownership structure within the energy sector at OSE. Secondly, it could be interesting to look at indicators on the level of commitment and involvement of owners and measures on the quality of corporate governance. A division of ownership into active, semi-active, semi-passive and passive based on participation on boards, general meetings, nomination committees, voting behavior (e.g. voting with their feet) , and then link this to firm performance could be interesting. It could further be interesting to study the ownership structure during financial turmoil, like including data from the global decline in financial markets in the fall of 2008. For example, one could hypothesize around repatriation of capital by international investors (flight to quality) where capital is moved from volatile markets to less risky markets of other countries. The tendency of investors to move toward safer investment vehicles during periods of high economic uncertainty could be subject to analyze changes in ownership structure for different identities and the effect this potentially has on firm performance.

7. Conclusions

This paper empirically investigates the relationship between ownership structure and firm performance, treating ownership concentration and owner identity as separate, but dependent dimensions of ownership structure. Our research is based on a large sample of quarterly data from non-financial companies on the Oslo Stock Exchange in the period 2001-2007.

Using OLS, we find a significant negative relation between ownership concentration and firm performance, measured by Tobin's Q. However, when controlling for fixed firm effects, we find no significant relationship. Existing research shows an emerging consensus in treating ownership concentration as endogenous in relation to firm performance. Using the method of instrument variables (two-stage least squares) to account for endogeneity of ownership structure, we find that the choice of instrument highly affects the significance of our results. Since we suspect that the results obtained from using instrument variables are driven by weak instruments, we cannot conclude (econometrically) that ownership concentration influences firm performance.

Our findings on ownership concentration are very much in line with the research by Bøhren and Ødegaard (2001), who study Norwegian non-financial companies in the period 1989-1997. However, our results on owner identity differ. We find that when international investors hold large fractions of stocks, or when an international owner is the largest shareholder, the effect on firm performance is positive. When the government is holding large fractions of stocks, or when the government is the largest shareholder, the effect on firm performance is negative. These results are independent of whether and how we account for endogeneity of ownership concentration.

In order to better understand the relationship between ownership structure and firm performance, more research and an extended theory foundation are needed. The importance of this is underlined in our thesis, and particularly concerning our findings on owner identity. In this regard, our results suggest that identity is a relevant dimension of ownership structure, and that including owner identity as a dimension of ownership concentration could increase the insights into the relationship between ownership structure and firm performance.

Appendices

Appendix 1: Summary of post-1985 studies

In this section we present a selection of studies on ownership structure and firm performance conducted after 1985. The list is not exhaustive. We choose to present the list chronologically. Articles marked with * are frequently cited as important articles on the subject.

Demsetz and Lehn (1985)* look at a sample of 511 U.S. firms from 1976-1980, including financial firms and regulated institutions. They use three measures for ownership concentration: the combined shareholdings for the 5 largest and 20 largest owners as well as an approximation of a Herfindahl measure of ownership concentration. As performance measure they use accounting rate of return as well as stock market return. They perform a cross-section OLS regression with concentration as the dependent variable, from which the concentration coefficient are used in cross-section OLS regression with firm performance as dependent variable. They find no statistical significant relationship between ownership concentration and firm performance. Ownership concentration is treated as endogenous.

Morck et al. (1988)* look at the relationship between managerial ownership and performance in a 1980 cross-section of 371 Fortune 500 firms. They measure performance primarily by Tobin's Q, and managerial ownership as the combined shareholdings of all board members who have a minimum stake of 0.2%. They estimate a piecewise linear regression and find a significant non-monotonic relation (increasing between 0% and 5%, decreasing between 5% and 25%, and increasing beyond 25%). It is not robust, however, to the use of profit rates as an alternative performance measure.

Murali and Welch (1989) determine whether differential financial performance exists between closely and widely held firms and if any incremental value of the firm is associated with majority ownership. Performance is measured using stock market based yardsticks and firm-specific accounting measures. They find that the stock market is efficient in assessing differential performance of a closely held and a widely held firm. If effective control is exercisable only with majority ownership, then no evidence is found of differential performance due to differences in agency costs between a majority owned and a widely held firm. Firm value is not necessarily maximized through majority ownership.

McConnell and Servaes (1990)* examine the relation between Tobin's Q and insider, and blockholder ownership in two different cross-sectional samples, one for 1976 and the other for 1986, using slightly more than 1000 Compustat firms. They find a positive relation for insider ownership, but diminishingly so as ownership becomes more important, and a positive but insignificant relation for blockholders. The relation between Q and insider ownership slopes upward until insider ownership reaches 40% to 50% and then slopes slightly downward. Their results are robust to the inclusion of the same control variables used by Morck et al. (1988) and to the use of accounting profit rate as an alternative performance measure.

Hermalin and Weisbach (1991)* estimate the effect of managerial ownership and board composition on Q. Managerial ownership is measured by the fraction of shares held by the present CEO and all former CEOs still on the board. Board composition is measured by the fraction of the firm's directors who are outsiders. They treat ownership and composition as endogenous, using their lagged values as instruments; panel data for five years are used. They find no relation between board composition and performance, but find a significant non-monotonic relation between managerial ownership and performance, a positive relation between 0% and 1%, a decreasing relation between 1% and 5%, an increasing relation between 5% and 20%, and decreasing beyond 20%.

Leech and Leahy (1991) examine 470 listed companies in the period 1983-1985 from different industries in Great-Britain. They argue that ownership concentration has equal to no effect on firm performance, but argue that dispersed ownership could lead to higher market capitalization, performance and growth in net assets than with concentrated ownership.

Prowse (1992) examine the structure of corporate ownership in a sample of Japanese firms in the mid 1980s. Ownership is highly concentrated in Japan, with financial institutions by far the most important large shareholders. Ownership concentration in independent Japanese firms is positively related to the returns from exerting greater control over management. This is not the case in firms that are members of corporate groups (keiretsu). Higher ownership concentration and the accounting profit rate in both independent and keiretsu firms are unrelated. The results are consistent with the notion that there exist two distinct corporate governance systems in Japan one among independent firms and the other among firms that are members of keiretsu.

Claessens et al. (1999) examine the relationship between ownership structure and corporate performance of 706 companies in the 1992-1995 period following the Czech Republic's mass-privatization program. They find that the more concentrated the ownership, the higher the firm profitability and labor productivity. These findings are weakly robust to the inclusion of control variables for the type of ownership, or to a correction for the endogeneity of ownership concentration.

Loderer and Martin (1997)* use acquisition data to estimate a simultaneous equation model in which Q and insider holdings are endogenous. Q, log of sales, daily standard deviation of the firm' stock returns, and daily variance of the firm's stock returns are used to explain insider holdings. Insider holdings, log of sales, and a dummy for whether the acquisition is financed with stock are used to explain Q. Insider ownership fails to predict Q, but Q is a (negative) predictor of insider ownership.

Xu and Wang (1997) analyze ownership structure, corporate governance and corporate performance in China. Two hypotheses are tested in the paper. That is the irrelevance of ownership concentration and the irrelevance of ownership mix. Results from their empirical analysis show that ownership structure (both the mix and concentration) indeed has significant effects on the performance of stock companies. First, there is a positive and significant correlation between ownership concentration and profitability. Second, the effect of ownership concentration is stronger for companies dominated by legal person shareholders than for those dominated by the state. Third, firms' profitability is positively correlated with the fraction of legal person shares, but it is either negatively correlated or uncorrelated with the fraction of state shares and tradable A-shares held mostly by individuals. Last, labor productivity tends to decline as the proportion of state shares increases.

Cho (1998)* uses cross-sectional data and ownership information from value line, first replicates Morck, et al.'s (1988) study and finds a similar non-monotonic relation between Q and management share holdings. However, he then estimates a system of three equations in which insider ownership depends on Q, investment, and a set of control variables, Q depend on insider 27 ownership, investment and a set of control variables, and investment depends on insider ownership, Q, and a set of control variables. His estimates for this system of equations indicate that Q affects ownership structure but not vice-versa.

Himmelberg et al. (1999)* extend the Demsetz and Lehn study by adding new variables to explain the variation in ownership structure. They also use a fixed-effects panel data model and instrumental variables to control for various possible unobserved heterogeneities. Ownership structure is measured by shareholdings of insiders (officers plus directors) secured from proxy statements. Their performance measure is Q although they claim that similar results are produced if return on assets is the measure of performance. They find that insider ownership is negatively related to the capital-to sales and R&D-to-sales ratios, but positively related to the advertising-to-sales and operating income to sales ratios. Controlling for these variables and fixed firm effects, they find that changes in ownership holdings have no significant impact on performance. When they control for endogeneity of ownership by using instrumental variables, they find a quadratic form of the effect of ownership on performance.

Holderness et al. (1999)* replicate, for 1935 and 1995, central aspects of the Morck et al. (1988) study and the Demsetz and Lehn study. As in Morck et al. (1988), they find a significant positive relation between firm performance and managerial ownership with the 0% to 5% range of managerial shareholdings but unlike Morck et al. they do not find a statistically significant relation beyond 5% managerial shareholdings. They also confirm the endogeneity of managerial shareholdings, which they find depends negatively on firm size, performance volatility, volatility squared, regulation, and leverage.

Bøhren and Ødegaard (2001) use very rich and accurate data from all non–financial OSE firms in 1989–1997. They find that ownership structure matters for economic performance, that insider ownership matters the most and is almost always value–creating, that ownership concentration destroys value, and that direct ownership is superior to investing through intermediaries like institutions and the state. The value of the firm decreases with increasing board size, with the use of non–voting shares, and when firms finance with more debt and pay higher dividends. Although these effects are very robust in single–equation models and thereby suggest that their sample firms have suboptimal corporate governance mechanisms, the conclusions are quite sensitive to the choice of performance measure. Moreover, most of the significant relationships disappear in simultaneous equations models, which may in principle handle both independence between governance mechanisms and reverse causality between governance and performance, which both are ignored by single–equation models. They suspect that this apparent evidence that real–world governance systems are optimal is driven by weak instruments in the simultaneous system. They suggest that, until they have a

better theory of how corporate governance and economic performance interact, the simultaneous equations approach may not have much to offer in terms of valid new insights.

Demsetz and Villalonga (2001)* investigate the relation between the ownership structure and the performance of corporations if ownership is made multi-dimensional and also is treated as an endogenous variable. They use a 223-firm random subsample of the sample in the Demsetz and Lehn (1985) study, and use a two-equation simultaneous equations approach, where ownership structure includes both ownership concentration (combined shareholding of the 5 largest owners) and insider holdings (percentage of shares owned by management). They find no statistically significant relationship between ownership structure and firm performance. Demsetz and Villalonga argue that ownership structure should be thought of as an endogenous outcome of decisions that reflect the influence of shareholders.

Chang (2003) uses a sample of group-affiliated public firms in Korea to examine the simultaneous nature of casual relationships between ownership structure and performance. Performance is measured as Q, market share, sales growth and return on invested capital (ROIC) The results show that performance determines ownership structure, but not vice versa, and provides strong evidence that controlling shareholders use insider information to increase their direct and indirect equity stakes in more profitable firms and transfer profits to other affiliates through intra-group trade. Their results give support to the observed link between ownership concentration and firm performance as a result of endogeneity, and not by a more effective monitoring of management. These findings highlight the importance of studying further the agency problems of controlling shareholders.

Gedajlovic and Shapiro (2002) examine the relationship between the ownership structure and financial performance of 334 Japanese corporations for the 1986-1991 period. The positive relationship they found between ownership concentration and financial performance (ROA) is consistent with agency theory predictions. In addition, they observe a more pronounced profit redistribution effect characterized by the transferring of financial resources from more to less profitable firms. These findings indicate the need to account for both economic incentives and social context in corporate governance research.

Pedersen and Thomsen (2003) examine the relationship between ownership structure and value of large European firms. They also utilize Norwegian data in their analysis. Using simultaneous estimation and controlling for nation and industry effects they find that

ownership concentration (measured by the fraction of "closely held" shares) has a positive effect on firm value (market-to-book value of equity), when the largest owner is a financial institution or another corporation. If the largest owner is a family or a single individual, ownership concentration has no effect on firm value, and the effect is negative if the largest owner is a government organization. Firm value is found to have a positive feedback effect on ownership concentration except for governments, which hold higher stakes in low-value firms. In other words, owner-identity matters, particularly in a Continental European institutional setting where ownership concentration is high and minority investor protection is low. Their results indicate a non-linear correlation similar to Morck et al (1998) and McConnell and Servaes (1990).

Welch (2003) examines the relationship between ownership structure and corporate performance in Australian listed companies. The study applies the models advanced by Demsetz and Villalonga (2001), examining the relationship between ownership and performance when ownership is modeled as a multi-dimensional endogenously determined variable. OLS results suggest that ownership is significant in explaining performance. However, when endogeneity is taken into account, ownership is not statistically dependent on the performance measure. Finally, she looks at previous research by authors including Morck et al. (1988) which suggests that the relationship between ownership and performance is nonlinear. We fit a generalized nonlinear model that nests models advanced previously. Results provide limited evidence of a nonlinear relationship between managerial share ownership and firm performance.

Minguez-Vera and Martin-Ugedo (2007) analyze the influence of ownership structure on firm value for 118 companies listed in Spain on 31.December 1999. They use Q as performance measure and find a non-significant relationship between the ownership of large blockholders and firm value. They also find a positive effect of the degree of control with regard to firm value. Endogenous treatment of these variables then reveals a positive effect for the ownership by major shareholders on firm value, although the opposite relationship is not significant; and a positive effect of the degree of control on Tobin's Q and vice versa. A positive effect is seen when the major shareholders are individuals.

Omran et al. (2008) studies the effect of ownership structure on firm performance through a range of Arabian countries (Egypt, Jordan, Oman and Tunis). 304 companies are analyzed between 2000 and 2002. They use a two-stage least square approach, where ownership

(combined holdings of the three largest blockholders) and firm performance (Tobin's Q) are made endogenous. The broad conclusion that emerges is that ownership concentration is an endogenous response to poor legal protection of investors, but seems to have no significant effect on firms' performance. However, owner identity matters. Including aggregate share of stock for different owner identities they find a negative association of individual investors with performance measures in financial institutions. Also interesting is the lack of a significant relation between foreign investors and performance measures but the presence of a positive one with market measures.

Appendix 2: Central institutional developments at the Oslo Stock Exhange

Below we list some important areas of efficiency increasing measures.

- Increased focus on reporting from companies through the Norwegian Society of Financial Analysts (NFF) and their "Stockman" award from 1995 in two classes, "Open" and "Small and medium sized", function as a good tool to recognize the importance of professional communication and information flow between companies and investors.

- The launch of the ASTS electronic trading system in February 1999 represented the end of an era for the OSE[27]. Now trading could take place from anywhere in the world electronically.

- In 2001 OSE introduced the SMARTS market surveillance system and over the next couple of years developed its expertise to become one of the leading exchanges in the world for electronic surveillance of market trading. The strong regulation of insider trading was also tightened by a new law in 1997.

- OSE switched to the same trading platform as the other NOREX exchanges in 2002. Moving on to the new system gave access to many international investment firms interested in trading shares in the Norwegian market.

- In 2006 OSE introduces extended trading hours in order to adjust to the international market.

- The past years has seen increased focus on Corporate Governance through the Norwegian Corporate Governance Board (NUES) and the Norwegian Code of Practice for Corporate Governance. The purpose of the Code of Practice is to clarify the respective roles of shareholders, board of directors and executive officers beyond the requirements of the legislation[28]. NUES is monitoring the need for adjustments of the code and the current edition of the code was issued in 2007.

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[27] Oslo Stock Exchange < http://www.oslobors.no/Oslo-Boers/Om-oss/Boersens-historie > (accessed 27. May 2009)

[28] The Norwegian Corporate Governance Board (NUES) < http://www.nues.no/English/ > (accessed 27.May 2009)

- Increased and extended education of market players, especially from Norwegian School of Economics and Business Administration (NHH) and NFF, through executive education and certification courses in finance, represents a central development.

- Established in 1995, the Norwegian Investor Relations Association (NIRA) aim to build a professional environment and awareness regarding investor relations among companies listed on the Oslo Stock Exchange[29]. NIRA is part of an increased focus on effective communication between the listed companies and the stock market.

The development, illustrated above, includes some of many important means that function to increase efficiency in the Norwegian stock market.

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[29] The Norwegian Investor Relations Association (NIRA) < http://www.nirf.no/pages/show/no/english/ > (accessed 27. May. 2009)

Appendix 3: List of Variables

Variable	Description	Calculation
AVROA	Average ROA for five historic quarters	
AVROE	Average ROE for five historic quarters	
BVA	Book value of assets	Calculated at the end of the quarter
BVD	Book value of debt	Calculated at the end of the quarter
BVE	Book value of equity	Calculated at the end of the quarter
DEBTASSETS	Debt to assets ratio	Book value of debt / book value of assets
DEBTEQUITY	Debt to equity ratio	Book value of debt / book value of equity
HH10	Herfindahl-Hirschman Index for the number of owners needed to have 10 % ownership share	See section 5.3 for details.
HH34	Herfindahl-Hirschman Index for the number of owners needed to have 34 % ownership share	See section 5.3 for details.
HH50	Herfindahl-Hirschman Index for the number of owners needed to have 50 % ownership share	See section 5.3 for details.
ID_ACC_FIN	Accumulated financial ownership	Percentage of outstanding shares owned by financial institutions / total number of shares. See appendix 5 for details.
ID_ACC_GOV	Accumulated government ownership	Percentage of outstanding shares owned by government / total number of shares. See appendix 5 for details.
ID_ACC_IND	Accumulated individual ownership	Percentage of outstanding shares owned by individual investors / total number of shares. See appendix 5 for details.
ID_ACC_INT	Accumulated international ownership	Percentage of outstanding shares owned by international investors / total number of shares. See appendix 5 for details.
ID_ACC_NFI	Accumulated non-financial ownership	Percentage of outstanding shares owned by non-financial institutions / total number of shares. See appendix 5 for details.
ID_FIN	Dummy variable: Largest investor is financial	See 5.2.5 for details.
ID_GOV	Dummy variable: Largest investor is government	See 5.2.5 for details.
ID_IND	Dummy variable: Largest investor is individual	See 5.2.5 for details.
ID_INT	Dummy variable: Largest investor is international	See 5.2.5 for details.
ID_NFI	Dummy variable: Largest investor is non-financial	See 5.2.5 for details.

L1	Percentage of shares owned by the largest owner	Number of shares owned by the largest owner / total number of shares
L10	Percentage of shares owned by the ten largest owners combined	Number of shares owned by the ten largest owners combined / total number of shares
L20	Percentage of shares owned by the twenty largest owners combined	Number of shares owned by the twenty largest owners combined / total number of shares
L25	Percentage of shares owned by the twenty-five largest owners combined	Number of shares owned by the twenty-five largest owners combined / total number of shares
L3	Percentage of shares owned by the three largest owners combined	Number of shares owned by the three largest owners combined / total number of shares
L5	Percentage of shares owned by the five largest owners combined	Number of shares owned by the five largest owners combined / total number of shares
L5MEAN	Mean concentration (measured as L5) for the industry for the quarter	
LOGL5	Log-transformation of L5 by Demsetz and Villalonga (2001).	log [L5 / (100-L5)]
LOGVALUE	The logarithm of firm value	Book value of assets + market value of equity. Calculated at the end of the quarter
MEANSPREAD	Mean spread	Calculated as the mean of daily spread during the quarter, calculated as offer-bid
MVE	Market value of equity	Calculated at the end of the quarter
NUMSHARES	Number of outstanding shares	Calculated at the end of the quarter
OI	Growth in operating income (year-on-year)	(Operating income / operating income same quarter last year) -1
Q	Tobin's Q	(Market value of equity + book value of debt) / (book value of equity + book value of debt)
QMEAN	Mean q for the industry for the quarter	
ROA	Return on Assets	Net Income / ((book value of assets at the start of the period + book value of assets at the end of the period)/2)
ROE	Return on Equity	Net Income / ((book value of equity at the start of the quarter + book value of equity at the end of the quarter)/2)
SDRETURN	Volatility of stock return	Standard deviation to daily stock return in the quarter $* \sqrt{63}$, where 63 is the average number of trading days in a quarter
SDRETURN2	Volatility of stock return squared	
SDROE	Standard deviation of Return on Equity	Calculated based on the full period 2001-2007
SDROE2	Standard deviation of Return on Equity squared	Calculated based on the full period 2001-2007

SEC_COD	Dummy variable for GICS sector Consumer Discretionary	See 5.2.4 for details.
SEC_COS	Dummy variable for GICS sector Consumer Staples	See 5.2.4 for details.
SEC_ENE	Dummy variable for GICS sector Energy	See 5.2.4 for details.
SEC_HCA	Dummy variable for GICS sector Health Care	See 5.2.4 for details.
SEC_IND	Dummy variable for GICS sector Industrials	See 5.2.4 for details.
SEC_ITE	Dummy variable for GICS sector Information Technology	See 5.2.4 for details.
SEC_MAT	Dummy variable for GICS sector Materials	See 5.2.4 for details.
SEC_TEL	Dummy variable for GICS sector Telecommunication Services	See 5.2.4 for details.
SEC_UTI	Dummy variable for GICS sector Utilities	See 5.2.4 for details.
SHARE10	The number of owners needed to have 10 % ownership share	See section 5.3 for details.
SHARE34	The number of owners needed to have 34 % ownership share	See section 5.3 for details.
SHARE50	The number of owners needed to have 50 % ownership share	See section 5.3 for details.
SHARETURNOVER	Share turnover during the quarter	Turnover / number of shares at the end of the quarter

Appendix 4: Summary statistics

```
    Variable |       Obs        Mean    Std. Dev.         Min          Max
-------------+--------------------------------------------------------------
          L1 |      3052    .2734656    .1698229    .0213114    .9893089
          L3 |      3052    .4487031    .1945917    .0612703    .9903483
          L5 |      3052    .5304452    .1931607    .0961251    .9960845
         L10 |      3052    .6373267    .1822508    .1745335    .9974846
         L20 |      3052    .7287495    .1617962    .2478974      .99826
         L25 |      3052    .7544659    .1542454    .2690339    .9984434
         L50 |      3052      .82373    .1299028    .3457757    .9990515
     SHARE10 |      3052    1.175623    .4329384           1           6
     SHARE34 |      3052    3.762123    4.080126           1          48
     SHARE50 |      3052    7.721822    8.732051           0          50
        HH10 |      3052    .9204051    .1845755    .1684374           1
        HH34 |      3052    .5645802    .3348917    .0375937           1
        HH50 |      3052    .3951769    .2966562           0           1
      NUMINV |      3052    4113.026    8679.086         114       97823
-------------+--------------------------------------------------------------
           Q |      3052    1.861457    1.720914    .3582283    29.78983
          OI |      3052    11.77575    221.3873   -471.8273      8615.5
         ROE |      3052   -.0071514     1.06768   -28.44444    34.02898
         ROA |      3052   -.0027882     .070181   -.9665067    .4370951
         BVA |      3052     7647063    3.31e+07       10756    4.83e+08
         BVD |      3052     4756023    2.10e+07           0    3.06e+08
         BVE |      3052     2890032    1.23e+07   -3.19e+07    1.77e+08
         MVE |      3052     6.41e+09    3.11e+10     2181128    5.39e+11
       SDROE |      3052    .2511867    .9459599    .0032391    10.00686
   DEBTASSETS |      3052    .5420072    .2390622           0    4.096338
   DEBTEQUITY |      3047    1.753006    4.658271   -.7558795    188.4852
-------------+--------------------------------------------------------------
     SEC_COD |      3052    .1156619    .3198714           0           1
     SEC_COS |      3052    .0468545    .2113618           0           1
     SEC_ENE |      3052    .2250983    .4177155           0           1
     SEC_HCA |      3052    .0491481    .2162126           0           1
     SEC_IND |      3052     .242464    .4286437           0           1
     SEC_ITE |      3052     .259502    .4384332           0           1
     SEC_MAT |      3052     .042595    .2019754           0           1
     SEC_TEL |      3052    .0114679    .1064899           0           1
     SEC_UTI |      3052    .0072084    .0846095           0           1
-------------+--------------------------------------------------------------
      ID_INT |      3052    .1906946    .3929132           0           1
      ID_FIN |      3052    .0665138    .2492188           0           1
      ID_NFI |      3052    .5638925    .4959822           0           1
      ID_GOV |      3052     .094692     .292837           0           1
      ID_IND |      3052    .0842071    .2777436           0           1
-------------+--------------------------------------------------------------
  ID_ACC_INT |      3052    .2047865     .202295    3.05e-06     .969511
  ID_ACC_FIN |      3052    .1461443    .1093014    3.40e-06    .7135577
  ID_ACC_NFI |      3052    .3681888    .2261894    .0010896    .9910028
  ID_ACC_GOV |      3052    .0492579    .1357463           0    .8243284
  ID_ACC_IND |      3052    .2306141     .182516    .0008832     .862674
-------------+--------------------------------------------------------------
    TURNOVER |      3052    4.13e+07    1.42e+08         100    2.08e+09
   NUMSHARES |      3052    1.09e+08    2.83e+08      655000    3.19e+09
    SDRETURN |      3052    .3636383    2.050662    .0172223    89.71224
   MEANSPREAD |      3050    .0634234    .1116795    .0010341    1.934797
-------------+--------------------------------------------------------------
      L5MEAN |      3052    .5391729    .0864325    .3877319    .8003567
       QMEAN |      3052    1.829973    .8522102    .6012786    7.376554
-------------+--------------------------------------------------------------
```

Appendix 5: Owner sectors

For each company in each quarter, we have data about the 50 largest owners and their share of stock. The owners are made anonymous, but classified according to owner sectors defined by VPS. The table below shows the different owner sectors represented in our dataset, and how we have chosen to group owners in broader sectors to use in our analyses.

ID_FIN: Financial owner

VPS code	VPS description
210	Commercial banks
250	Savings banks
310	Credit companies
370	Finance companies
380	Mutual funds
390	Other financial enterprises
410	Life insurance / private pension funds
470	Non-life insurance companies
490	Financial auxiliaries

ID_GOV: Central and local government

VPS code	VPS description
110	Central government administration
111	Folketrygdfondet
112	Ministry of trade and industry
113	Ministry of petroleum and energy
190	Government lending institutions
510	Counties
550	Municipalities
610	Central government business administration
630	State-owned PLCs
635	Government companies
660	Local government business administration
680	Autonomous municipal enterprises

ID_IND: Individual investors

VPS code	VPS description
28*	Private Investment Companies
29*	Private Investment Companies
30*	Private Investment Companies
31*	Private Investment Companies
790	Private unincorporated enterprises
810	Households

ID_INT: International investors

VPS code	VPS description
900	International
990	International physical persons
991	Nominee accounts

ID_NFI: Non-financial institutions

VPS code	VPS description
710	Limited companies etc.
740	Private non-profit institutions serving enterprises
760	Quasi-corporate enterprises etc.
770	Private non-profit institutions serving consumers

Source: VPS - The Norwegian Central Securities Depository, http://www.vps.no

* These categories are defined by Døskeland and Mjøs (2008), aiming to identify private persons who invest through their own limited companies. See Døskeland and Mjøs (2008) page 105 for more information (in Norwegian).

Appendix 6: Supplementary regressions

<u>Table 28: Year-by-year OLS</u>

Y	LOGL5	SEC_ COD	SEC_ ENE	SEC_ HCA	SEC_ IND	SEC_ ITE	SEC_ MAT	SEC_ TEL	SEC_ UTI	LOG- VALUE	SD- RETURN
1	-*	+	-	+***	+	+*	-	-		+	+
2	-**	+	-	+**	+	+**	+	-	+**	+***	-
3	-**	+	-	+***	-	+**	+	-	+**	+	+**
4	-	+	-	+***	+	+**	+	+	+*	+	+
5	-	+**	+	+***	+	+***	-	-	+	+*	+
6	-	+*	-	+***	+	+***	-**	-	-	+*	+
7	-	+	+	+***	+*	+***	-	+	+	+**	-***

* p<0.10, ** p<0.05, *** p<0.01
In this model, Y1 equals 2001, Y2 equals 2002 and so forth.

<u>Table 29: Fixed-effects regression on ownership concentration - different time periods</u>

```
---------------------------------------------------------
                        (1)            (2)            (3)
DEPENDENT VARIABLE:      Q              Q              Q
---------------------------------------------------------
LOGL5                 0.015         0.335**       -1.298***
                      (0.13)        (2.32)        (-3.96)

LOGVALUE              0.728***      1.180***       0.325**
                      (18.97)       (23.29)        (2.41)

SDRETURN              0.006         0.014         -0.022
                      (0.60)        (1.41)        (-0.43)

_cons                -8.391***    -12.927***      -9.543***
                     (-10.50)      (-13.34)       (-3.33)
---------------------------------------------------------
r2                    0.113         0.218          0.023
r2_a                  0.049         0.154         -0.168
N                  3052.000      2110.000        942.000
---------------------------------------------------------
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
(1) Measured in the period 2001-2007
(2) Measured in the period 2001-2005
(3) Measured in the period 2006-2007
```

Table 30: 2SLS on owner identity, measured by aggregate ownership. Stock volatility as instrument.

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		-	-	+	-**
Non-fin	+		-	+	+
International	+	+		+	+
Government	-	-	-		-
Individual	+**	-	-	+	

`* p<0.10, ** p<0.05, *** p<0.01`

Table 31: 2SLS on owner identity, measured by aggregate ownership. Share turnover as instrument.

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		-**	-***	-	-***
Non-fin	+**		-	+***	+
International	+***	+		+**	+*
Government	+	-**	-**		-
Individual	+***	-	-*	+	

`* p<0.10, ** p<0.05, *** p<0.01`

Table 32: 2SLS on owner identity, measured by aggregate ownership. Stock volatility, assets and average concentration by industry as instruments.

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		-	-**	+	-***
Non-fin	+		-*	+***	-
International	+***	+*		+***	+
Government	-	-***	-***		-**
Individual	+***	+	-	+	

`* p<0.10, ** p<0.05, *** p<0.01`

Table 33: 2SLS on owner identity, measured by id of largest owner. Stock volatility as instrument.

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		-	-	+	-
Non-fin	+		-*	+***	-
International	+	+*		+***	-
Government	-	-***	-***		-***
Individual	+	+	+	+***	

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

Table 34: 2SLS on owner identity, measured by id of largest owner. Share turnover as instrument.

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		-	-**	+	-**
Non-fin	+		-	+***	-
International	+**	+		+***	-
Government	-	-***	-***		-***
Individual	+**	+	+	+***	

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

Table 35: 2SLS on owner identity, measured by id of largest owner. Stock volatility, assets and average concentration by industry as instruments.

	Financial institutions as reference	Non-financial institutions as reference	International investors as reference	Government as reference	Individual investors as reference
Financial		-	-*	+*	-*
Non-fin	+		-*	+***	-
International	+*	+*		+***	-
Government	-*	-***	-***		-***
Individual	+*	+	+	+***	

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

Appendix 7: List of tables

Appendix 8: List of figures

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