Aalto University
School of Economics

# Agency theory and ownership structure - Estimating the effect of ownership structure on firm performance

Economics

Master's thesis

Tuomas Laiho

2011

Department of Economics
Aalto University
School of Economics

# Abstract

This thesis tries to answer the question whether ownership structure matters for firm performance. The starting point for the analysis is the agency theory by Jensen and Meckling (1976), which predicts that higher levels of managerial ownership structure increase firm performance due to an incentive effect. Other authors have in turn suggested that large outside owners might have a role to play as monitors of the management and might thus enhance performance (Shlefer and Vishny 1986 and Zeckhauser and Pound 1990). On the other hand, the private benefits literature (Barclay and Holderness 1989 and Bebchuk 1999) suggests that high ownership concentration may lead to the extraction of the firm's resources by the dominant owners at the expense of other shareholders. The empirical part of the thesis tests these two hypotheses, which can be combined if we allow the effect of ownership to be nonlinear.

A large amount of empirical research has been published on the subject. Demsetz and Lehn (1985) were the first to estimate the effect of ownership concentration on firm performance and they found no relationship. Important research has also been published by Himmelberg et al. (1999), who estimate a fixed effects model on firm performance and insider ownership and also fail to find a relationship. Studies using non-U.S. data have, however, found a positive relationship even when controlling for endogeneity. Controlling for the endogeneity of ownership is important both in the light of the empirical results and the theoretical discussion.

The thesis uses a panel dataset of Finnish listed companies over the years 2007-2009 to estimate a fixed effects model similar to Himmelberg et al (1999). In addition to control variables the model includes variables for insider ownership, ownership concentration and managerial compensation. The results from OLS regressions are largely in line with agency theory predictions, but statistical significance dissappears when controlling the endogeneity of ownership by two-stage least squares estimation. Upon closer inspection this turns out to be caused by the weakness of the used instruments. We then face the dilemma of choosing between OLS estimates biased due to endogeneity and 2SLS estimates biased due to weak instruments.



Keywords: Agency theory, private benefits, ownership structure, firm performance

# Tiivistelmä

Tämä pro gradu -tutkielma yrittää vastata kysymykseen onko omistusrakenteella merkitystä yritysten kannattavuudelle. Lähtökohtana tutkimukselle toimii Jensenin ja Mecklingin (1976) agenttiteoria, jonka mukaan suurempi liikkeenjohdon omistus parantaa kannattavuutta kannustinvaikutuksen ansiosta. Muut tutkijat ovat puolestaan ehdottaneet, että suuret johdon ulkopuoliset omistajat voivat valvoa liikkeenjohdon toimia ja siten parantavat yrityksen kannattavuutta (Shlefer ja Vishny 1986 sekä Zeckhauser ja Pound 1990). Määräävien omistajien rooliin keskittyvä kirjallisuus on sen sijaan korostanut omistajien mahdollisuutta hyödyntää yritysten resursseja omiin tarkoituksiinsa, ja on siten ehdottanut, että omistuksen keskittyminen voi itse asiassa olla muiden osakkeenomistajien näkökulmasta haitallista (Barclay ja Holderness 1989 ja Bebchuk 1999). Tutkielman empiirinen osuus tarkastelee näitä kahta hypoteesiä, jotka voidaan yhdistää, jos omistusrakenteen vaikutuksen annetaan olla epälineaarinen suhteessa kannattavuuteen.

Aihetta käsittelevä empiirinen kirjallisuus on laaja. Demsetz ja Lehn (1985) estimoivat ensimäisinä omistuksen keskittymisen vaikutusta yritysten kannattavuuteen löytämättä tilastollisesti merkkittävää yhteyttä. Himmelberg et al. (1999) ovat julkaisseet myös maininnan arvoisen artikkelin, jossa he estimoivat kiinteiden vaikutusten mallin sisäpiiriläisten omistusten ja kannattavuuden välillä, mutta eivät löydä tilastollisesti merkittävää yhteyttä. Tutkimukset, jotka ovat käyttäneet muuta kuin amerikkalaista aineistoa, ovat kuitenkin onnistuneet löytämään positiivisen yhteyden myös silloin kun omistajuuden endogeenisyys on otettu huomioon. Omistajuuden endogeenisyyden huomioon ottaminen on tärkeää niin empiiristen löydösten kuin aiheesta käydyn teoreettisen keskustelun perusteella.

Tutkielma käyttää aineistonaan suomalaisista pörssiyrityksistä vuosilta 2007-2009 kerättyä paneelia, jota käytetään Himmelberg et al. (1999) tapaan kiinteiden vaikutusten mallin estimoimiseen. Kontrollimuuttujien lisäksi mallissa ovat muuttujina sisäpiiriläisten omistus, omistuksen keskittyminen ja liikkeenjohdon osakeperusteiset palkkiot. Pienimmän neliösumman menetelmällä estimoituna mallin tulokset ovat suurelta osin agenttiteorian mukaisia, mutta tilastollinen merkitsevyys katoaa, kun omistusrakenteen endogeenisyyttä kontrolloidaan kaksivaiheisella pienimmän neliösumman menetelmällä. Tarkemmassa tarkastelussa syyksi paljastuu käytettyjen instrumenttimuuttujien heikkous. Joudumme siten valitsemaan joko PNS-menetelmällä saatujen tulosten, jotka ovat harhaisia endogeenisyyden vuoksi, tai kaksivaiheisen PNS-menetelmän tulosten välillä, jotka ovat harhaisia instrumenttimuuttujien heikkouden vuoksi.

Asiasanat: Agenttiteoria, omistusrakenne, kannattavuus

# Contents

# List of Tables



# List of Figures

# 1 Introduction

Adam Smith famously warned against the negligence and profusion of managers handling money other than their own. (Smith 1776) The question driving this master's thesis stems directly from Smith's warning: does ownership structure matter for firm performance? Ownership structure means here both the managers' share of the firm and the distribution of the outsider claims; whether there is a single or a small group of dominant owners. The thesis builds on the agency theory by Jensen and Meckling (1976) and surveys the most important empirical literature. The empirical section presents results from a panel data model on the effect of ownership structure on firm performance using a dataset on Finnish listed companies.

Agency theory holds a central role in the corporate governance literature. It describes the fundamental conflict between self-interested managers and owners, when the former have the control of the firm but the latter bear most of the wealth effects. Jensen's and Meckling's (1976) original model illustrates this by describing how lower managerial stakes lead to increases in non-pecuniary spending by the managers as they do not fully internalize the costs. Agency problems of this kind generate agency costs. A key ingredient in their theory is that outside shareholders cannot costlessly observe the managers' actions. While the model makes many restricting assumptions, the results are applicable to a more general setting as shown by the numerous theoretical and empirical articles that have followed Jensen's and Meckling's work.

Jensen's and Meckling's insight has also lead to models, where the ownership structure matters not only in the sense how much the company insiders own, but also in the sense how concentrated the holdings of the outside shareholders are. Large shareholders are argued to monitor the management better than small shareholders as they internalize larger part of the monitoring costs and have sufficient voting power to influence corporate decisions. In addition, a range of other mechanisms that either align the interests of the managers and owners or limit managerial discretion have been suggested to reduce agency costs. The view taken in this thesis is that in order to analyze the effects of ownership structure the existence of these other mechanisms must be accounted for. This is hardly

a new perspective as Alchian (1969), for example, already argued along comparable lines, but one that seems also to be credible in light of the empirical results.

There is a different view to the role of ownership structure in firms besides agency costs generated by the managers. Several authors (e.g. Barclay and Holderness 1989, Bebchuk 1999) have suggested that owners with high ownership share might use their position to acquire private benefits, which are not enjoyed by other shareholders. Such benefits might include, for example, the consumption of the goods produced by the firm, extraction of assets or takeover defense for insiders. If these benefits have adverse effects for firm performance, higher ownership concentration, either by outsiders or insiders, might actually hurt performance. The main thrust of the private benefits literature is that there is not only an agency problem between owners and managers, as the relationship between large and small shareholders can be thought in the same terms.

Ultimately, the question on the effect of ownership structure on firm performance, is a question concerning the incentives of managers and owners and their ability to control firm decision making. We are interested in how higher ownership levels affect decision making by managers and owners, i.e. whether they will take more or less actions that maximize firm value. Control, as gained through voting rights attached to ownership, naturally enters as a factor to this question, because it determines whether the shareholders can coerce the firm to do their bidding. While higher ownership levels might align the incentives, it also means better ability for the controlling owners to acquire private benefits. This is what we want to test with the empirical model: are higher ownership levels beneficial or detrimental for firm performance?

Long before the discussion on agency costs and private benefits, Berle and Means (1932) had already written extensively on the separation of ownership in large public companies. Many others have since contributed to this discussion. By separation of ownership and control, Berle and Means referred to the fact that a majority of the public companies were owned by small shareholders with little chance of influencing corporate decision making. The control of the companies had then shifted to the managers, who had an opportunity and an incentive to misuse their position. Berle and Means predicted that the separation of ownership and control would adversely affect corporate performance. This thesis is

part of this long discussion on ownership structure that has continued to this day.

In terms of empirical research, the approach taken in this thesis follows the previous empirical research fairly closely. Important work in this regard has been published by Demsetz et al. (1985, 2001) and Himmelberg et al. (1999), who have constructed econometric models to estimate the effects of ownership structure. Demsetz and Lehn (1985) estimate a cross-sectional model to examine the effects of concentrated ownership on firm performance to test the Berle and Means hypothesis and find no relationship. Demsetz and Villalonga (2001) extend this analysis to a simultaneous equations setting, where both firm performance and ownership are determined endogenously with similar results. Controlling for the endogeneity of ownership seems important both in the light of the empirical results and the theoretical discussion. Himmelberg et al, in turn, analyzed the same relationship with regards to insider ownership and estimated a fixed effects model. Unlike Morck et al. (1988) who first analyzed the relationship between insider ownership and firm performance, Himmelberg et al. fail to find a statistically significant relationship, when controlling for endogeneity. Indeed, this has been achieved only in studies using non-U.S. data (Hu and Izumida 2008, Kapopoulos and Lazaretou 2007). We will follow the approach by Himmelberg et al. in our own empirical model rather closely, because the fixed effects model offer a convenient way to control unobservable firm characteristics.

The dataset used in this study includes 105 Finnish non-financial listed companies over the years 2007-2009. The data were acquired from annual reports of the companies, Thomson Financial Worldscope and Thomson Financial Datastream data services. ETLA also contributed by supplying a dataset on Finnish companies that included approximately 90 largest listed firms. The ownership data, gathered from the annual reports, show that the ownership of Finnish listed companies is very concentrated. A median largest owner owns more 20 % of the company and the five largest more than 40 %. The insider holdings are also relatively high with a mean of 14 %. The characteristics of the ownership data then, not surprisingly, place Finland firmly to the category of countries where ownership is highly concentrated.

The empirical section presents results for a fixed effects model relatively similar to Himmelberg et al. (1999) with the inclusion of variables for equity based managerial compen-

sation and ownership concentration. To our knowledge, this is the first study to include all three. The fixed effects framework is arguably the best alternative, as it allows us to control for many unobserved firm characteristics that are likely otherwise to influence the results. Firm performance is measured by Tobin's Q, which is also the most commonly used measure in the previous research. The estimation results, when treating ownership exogenous, largely support the agency theory predictions, but show little statistical significance, when endogeneity is controlled by a two stage least square (2SLS) regression. This is likely due to the weakness of the used instruments, which fail to properly identify the model. The endogeneity tests provide support for the claim that ownership is indeed endogenous relative to performance. We then face the dilemma of choosing between standard OLS results biased by endogeneity and the 2SLS results biased by weak instruments.

The thesis is organized as follows: chapter 2 discusses agency theory, private benefits and different agency control mechanisms suggested in the literature. Chapter 3 goes through the comparable empirical literature and chapter 4, finally, presents the used data, introduces the methodology, the estimated fixed effects model and presents the estimation results.

# 2 Agency problems and agency control mechanisms

## 2.1 Agency theory and ownership structure

Agency theory is concerned with the conflicting interests of principals and agents. Jensen's and Meckling's (1976) model on agency costs and ownership structure holds a central role in the corporate governance literature. Its predictions relating to agency problems are central to the topic of this thesis. However, as the theory abstracts from all other frictions away except the one between managers and owners, the empirical model we will build later on is significantly different. The theory, nevertheless, demonstrates well the fundamental conflict of interest between managers and owners.

In the literature preceding Jensen and Meckling (1976), the agency problems caused by

outsider (dispersed) ownership were called the problem of the separation of ownership and control, which originated in Berle and Means (1932) work. Jensen and Meckling put their discussion in to a more formal context with explicit models on the behavior of the agents. The point in this literature as well as in Jensen's and Meckling's model is that there is a conflict of interest as managers do not bear the full consequences of their actions. It is good to be aware that a long discussion precedes Jensen's and Meckling's work, and for example Alchian and Demsetz (1972) had before analyzed a similar problem of managerial shirking and monitoring. The main advantage of Jensen's and Meckling's approach is its generality, agency relationships are all around us. As we will see the same approach can also be used to describe an agency problem between large and small shareholders.

The key insight of Jensen and Meckling (1976) was to model the relationship between owners and managers similar to one between a principal and an agent. The owners contract the managers to perform the controlling tasks of a firm, and as both seek to maximize their own utility and are self-interested a conflict of interest arises. As the managers have the effective control of the firm, they have the incentive and the ability to consume benefits at the expense of the owners. Jensen and Meckling define the costs caused by the divergence of interests between owners and managers as agency costs consisting of 1) the monitoring expenditures by the principal, 2) bonding expenditures by the agent and 3) the residual loss, on which we will be especially focusing on.

Principals' monitoring costs arise from activities designed to limit the agents' (from the principals' point of view) harmful actions. Bonding expenditures result from the agents' actions to assure the principals that they will not take certain actions. Despite these (optimal) monitoring and bonding expenditures by the principals and the agents, there will still be a loss caused by the divergence of the decisions taken by the agents and the decisions that would maximize the principals' welfare. These decisions by the managers can entail, for example, shirking from work or the consumption of perquisites. This cost created by the agency relationship is defined as the residual loss, and as mentioned it is the component we are most interested in. The empirical studies mostly refer (implicitly or explicitly) to it, when they discuss agency costs.

The starting point for the analysis of agency costs is a firm, whose equity is owned 100

% by the manager. Decisions in which we are interested in this setting not only include pecuniary benefits, but especially non-pecuniary benefits such as having larger office space, more comfortable furniture, making charitable contributions, having a larger secretarial staff than necessary, shirking from work, etc. When the manager owns 100 % of the equity, the optimal amount of both pecuniary and non-pecuniary benefits are reached as she bears all the costs created by these actions. Agency costs enter into the picture, if the owner-manager sells limited liability equity claims on the firm and thus owns less than 100 %. She will then bear only a fraction of the costs on the non-pecuniary benefits paid by the firm. The agency costs are a natural consequence of the utility maximization by self-interested manager. We will analyze this in more detail. (Jensen and Meckling 1976)

Monitoring by outside shareholders is likely to decrease the costs created by the manager as it limits her discretion, but is unlikely to eliminate them completely. However, the owner-manager cannot escape bearing the ultimate price for the agency costs as she will bear the wealth effects on the value of her equity share, if the market anticipates the agency costs generated by her actions.[1] For the empirical part, the idea that the markets anticipate agency costs is a crucial assumption, as we will look at the effect of ownership structure on equity values. Furthermore, the manager then has an incentive to try to limit agency costs. (Jensen and Meckling 1976)

To put the managers behavior and its effect on firm value into a more formal context we need to make a set of restricting assumptions. Jensen and Meckling (1976) present the following list as their permanent assumptions:

1) No taxes
2) No trade credit
3) Outside equity is non-voting
4) No warrants, convertible bonds, complex financial instruments etc. can be issued
5) Outsider owners only gain utility through the wealth effects on the firm

[1]This can also be thought as a game, where the Nash equilibrium by the manager is to spend more non-pecuniary benefits than she would otherwise, when there is an outside owner. Even though it would be beneficial for her, she cannot commit to the decision not to spend after the outside investment is made. The outside owners know this and will price the equity share correspondingly.

6) Single period world

7) Money wages for the owner-manager held constant

8) There is a single manager with ownership interest in the firm

In addition, for purposes of analyzing the effect of outside equity, the size of the firm is fixed, presence of diversifiable risk is ignored and since we are really interested in the residual loss on equity values we also drop the effects of external debt, monitoring and bonding activities. In addition, all of the manager's wealth is tied to the firm. Jensen and Meckling (1976) then define the following terms:

$X = \{x_1, x_2, ...x_n\}$ = vector of all factors and activities within the firm from which the manager derives non-pecuniary benefits and $x_i$ are defined so that her marginal utility is positive for each of them

$C(X)$ = total dollar cost of the non-pecuniary benefits

$P(X)$ = total dollar value to the firm of the productive benefits of X

$B(X) = P(X) - C(X)$ = net dollar benefit to the firm from X ignoring any effects of X on the equilibrium wage of the manager

The optimal level of X from the firm's perspective is then defined by the first order condition:

$$\frac{\partial B(X^*)}{\partial X^*} = \frac{\partial P(X^*)}{\partial X^*} - \frac{\partial C(X^*)}{\partial X^*} = 0$$

This allows us to define the value of excess managerial spending on non-pecuniary benefits for any vector $X \geq X^*$ (with $X^*$ being the optimal solution obtained above) as $F \equiv B(X^*) - B(X) \geq 0$, which is the dollar cost of providing the increment $X - X^*$ and the loss on firm value. For a given level of her own equity, $\alpha$, the manager will choose the amount of X that maximizes her own utility, and the lower $\alpha$ is the more this amount will differ from $X^*$ as she will bear only $\alpha C(X)$ of cost that the firm has to pay for these factors and activities. Let's denote the amount of $X$ that maximizes manager's utility by $\hat{X}$, and we can then set $F \equiv B(X^*) - B(\hat{X})$. This is amount of excess non-pecuniary consumption (from the perspective of the firm) by the manager and we can use it to derive the amount of residual loss created by the existence of outside equity. Note that there

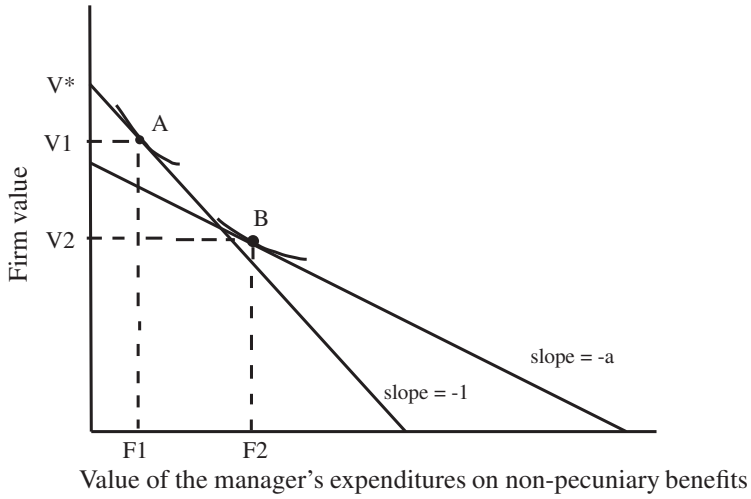


Figure 1: Owner-manager's choice depending on her level of ownership

will be excess non-pecuniary spending even when the manager owns the whole firm, but this does not create agency costs as the manager bears the costs in full and chooses her level of spending accordingly. (Jensen and Meckling 1976)

The effect of the manager's non-pecuniary spending can illustrated by a graph with firm value, $V$, on one axis and the value of manager's non-pecuniary benefits, $F$ on the other. The manager maximizes her utility over wealth ($V$) and the non-pecuniary benefits ($F$).

Figure 1 shows the manager's choice and its effect on firm value, when we are holding both the firm size and the manager's wage constant. To illustrate the manager's choice, there are two different levels of ownership in the graph that determine the manager's consumption of non-pecuniary benefits. Note that we are not considering the sale of equity in this case, since that would have an additional wealth effect on manager's consumption. When she owns all the equity, i.e. $\alpha = 1$, the slope of the budget line equals -1. The situation in this case is depicted by the point A on the graph. The manager bears all the costs from her non-pecuniary benefits and chooses to consume the value of $F1$, which then gives the firm value of $V1$. This will also be the value of the firm, when the manager sells her equity and if the buyer can costlessly force her to consume only $F1$ of the benefits. There is little reason, however, to assume that this would usually be the case. In point B, the manager owns only $a$ of the firm with the rest, $1 - a$, belonging to outside investors,

who have no say in the firm's business. The slope of the manager's budget line is now $-a$ (the fraction of the costs she bears) and as she maximizes her utility the choice of non-pecuniary benefits will change accordingly to $F2$. This will mean that the firm value is then $V2$ due to increased managerial expenditure on non-pecuniary benefits.

The residual loss, lost firm value, caused by the problem of agency is in figure 1 $V1 - V2$. If we also considered the effect of selling the equity, we would know that the new budget line would have to cross point A (the minimum the manager demands) with a slope of $-a$ and the level of non-pecuniary spending could, depending on manager's preferences, be even higher than in point B. Figure 1 illustrates that the agency costs are created through the manager's budget constraint, i.e. how much she will bear of the costs of the non-pecuniary benefits.

Even though Jensen and Meckling (1976) present a special case in their paper, it demonstrates the conflict between managers and owners well. Naturally, we have left out any effects of the monitoring or the bonding (compensation tied to firm value, etc.) activities taken by the outside investors or the managers that would help to reduce agency costs. Nevertheless, even if most of the assumptions are loosened, the conflict of interest between owners and managers is relevant as long as the owners cannot observe the managers actions or their consequences completely. An example of what happens, when the monitoring by the external shareholders is taken into account can be found from Pagano and Röell (1998). They show that the owner-manager prefers more dispersed holdings by outsiders due to lesser monitoring and thus higher discretion to spend firm's resources on non-pecuniary benefits.

The main point of Jensen's and Meckling's (1976) model is that there is a tradeoff in the form of agency costs between having more or less insider ownership. Agency costs are created whenever the manager also controls an outsider's investment besides her own, because there is a fundamental conflict of interest. This is the same conclusion Berle and Means argued already in 1932 by saying that the separation of ownership and control in large public companies created room for managers to use the wealth of the companies to their own advantage. Jensen and Meckling formulated a theory of ownership structure based on this problem of agency. Because of the conflict of interest between managers

and outside shareholders, firm performance is not independent of ownership structure.

Jensen and Meckling (1976) also analyze in their article how debt financing affects the manager's incentives. Their main conclusions are similar to those with outside equity. Higher debt levels increase the moral hazard (incentive to take risk) of the manager, and the cost of taking extra risk (and the measures designed to limit it) can be thought as agency costs. These agency costs are borne by the firm as increased cost of borrowing. Jensen and Meckling further argue that due to agency problems the probability distribution of the future cash flows is not independent of the level of debt a company holds — higher levels of debt lead to more risk taking and thus to higher variance in the returns. The levels of outside equity and debt are determined simultaneously as to minimize the total agency costs (and hence to maximize firm value) composed of agency costs on outside equity and agency costs on debt. The detailed exposition of their ownership structure model is left aside; the conclusions presented above nevertheless apply to it as well. What is important here is that there are different kinds of outside investors that are affected by agency problems and bear different sets of agency costs.

It is good to mention that debt has also been suggested to limit the agency costs of equity holders. Jensen (1986) argues that debt decreases the amount of free cash flow in managers' control and hence limits their discretion. See also Grossman and Hart (1982) for a similar kind of argument. Thus, firms with higher levels of debt might be better performing (higher valued relative to their assets) than firms with low levels of debt, although higher levels of debt incur agency costs for debtholders.

If agency costs are so prevalent, why there are firms owned by outsiders in the first place? There are several factors that might cause the separation of ownership and control to be more efficient than a single owner-manager or a small group of owner-managers. For example, Jensen and Fama (1983) consider the complexity, i.e. dispersion, of the information needed to make decisions as a crucial element whether separation is an efficient solution or not. If a single agent or a small group of agents possess all the relevant information for firm-wide decision making, it pays to minimize agency costs by having the same agents also to own the firm. In contrast, when the necessary information is dispersed to several agents concentrating the ownership to them is no longer as efficient

due to agency problems. It may then be better to take advantage of the specialization of decision making by these agents (who do it best) and separate ownership entirely from control by having these tasks done by different agents, which also allows the owners to benefit from diversification of risk. This is in essence an optimization problem depending on the (largely unobserved) firm characteristics. It is important to stress that agency costs are not a sign of non-optimality as they are precisely the result of optimizing behavior from the part of the agent and the principal.

Jensen and Fama also make a point that, when the decision making is in the firm is diffuse, agency problems "can then be reduced by separating the management (initation and implementation) and control (ratification and monitoring) of decisions."(Jensen and Fama 1983, 308) In smaller firms this can mean that managers do the management of decisions and shareholders the controlling of decisions, but in larger firms diffusion and separation of both at different levels of the organization are needed. There are of course many other factors besides the nature of decision making information that can tilt the balance to the side of separation of ownership and control. An obvious reason for this is firm size (found also in Jensen's and Meckling's (1976) paper), otherwise the firm size is constrained by the owner-managers wealth (and ability lend) and the possible benefits offered by economies of scale are left unused.

To briefly sum up the discussion above, agency costs created by a particular ownership structure are just one of the variables affecting the ownership structure and not necessarily the most crucial one. Other firm characteristics also play a significant role affecting both ownership and agency costs. Demsetz (1983) discusses at length different elements that affect the ownership structure in this light. We will return later to this issue, when discussing the empirical literature.

Jensen's and Meckling's (1976) analysis of agency problems serves as the starting point for the analysis, although, as already mentioned, there are many further complications to be taken into account before we can build an empirical model. The next section discusses the main (external) mechanisms that control agency problems.

## 2.2 Agency control mechanisms

Jensen's and Meckling's (1976) model shows that agency problems exist, when there are possibilities and incentives for the management to pursue their own interest at the outside stakeholders' (both equity and bondholders) expense. However, agency problems and costs associated with them can be alleviated with several mechanisms. While Jensen and Meckling focus on the ownership structure, managerial shareholding, several other mechanisms have been suggested in the literature on agency problems. Berle and Means (1932) saw concentrated ownership, one or a few large owners, as a good disciplining device for managers. On the other hand, concentrated ownership has also been seen to harm firm performance in the form of private benefits (e.g. Bebchuck 1999). Other suggestions for control mechanisms of agency problems include equity based managerial compensation (e.g. Haugen and Senbet 1981), which ties managerial remuneration to the performance of the share price (gives a potential ownership share). The effect of leverage on agency costs of equity holders was already discussed earlier. Market for corporate control, i.e. the threat of hostile takeovers, has also been seen to control agency problems (Manne 1965). Fama (1980) has also asserted that managerial labor market acts as a control mechanism as managers have incentives to guard their reputation. Competition in product markets has been similarly argued to discipline management (Hart, 1983). We will go through these mechanisms in more detail next. Common to all these mechanisms is that they either align the incentives of managers and owners or then they limit the discretion of the managers.

The mentioned control mechanisms are only loosely tied to the agency theory, and while being mutually compatible they usually need several new assumptions to be modeled. The view taken here is that the firm chooses among several control mechanisms to minimize agency costs. This is not only in line with Jensen's and Fama's (1983) discussion, but first articulated by Alchian (1969). The main idea is that such mechanisms form an interrelated system that shapes the corporate governance and agency costs in a given firm. Although the discussion in this section is not directly linked to the empirical model, it serves to point out the different aspects of agency problems and highlights the complexity of estimating any empirical model on these issues. The purpose of the empirical model is to test the

hypotheses laid out in this section for the effects of ownership structure, while controlling for the effects of the others.

### 2.2.1 Monitoring by large shareholders and extraction of private benefits

The effect of increasing insider shareholding on agency costs was already discussed in detail in the previous section; as the managers bear larger fraction of the costs they will take less and less actions causing agency costs. But why would a more concentrated outside ownership lower agency costs? The most often stated explanation is that shareholders with only small stakes in a company fail to monitor management effectively. A more concentrated ownership, in the form of large shareholders, creates more effective monitoring. There are two important obstacles for effective monitoring of the management that large shareholders may help to solve: they may reap enough benefits by staying informed that it exceeds the costs of obtaining the needed information and they may also have a sufficiently large share of the votes that they can effectively influence corporate outcomes (even with a minority holding). Small shareholders have trouble doing this collectively as they internalize only a small part of the possible gains by themselves and suffer from free-rider problems. Easterbrook and Fischel (1983) have analyzed the voting structure of firms and the free-rider problems large shareholders may help to overcome in more detail.

The important factor for the large shareholders to have an effect is that monitoring is costly, consuming resources such as time and money. The monitoring meant here is not simply observing the managers' actions, but also figuring out their consequences in an uncertain world and actively participating in corporate decision making. In terms of Jensen's and Meckling's (1976) model, one can think that agency costs are decreasing in the share the largest owner (or largest owners) holds due to increased efficiency in monitoring.

There are formal models explaining why the existence of a large blockholder may increase corporate performance. Zeckhauser and Pound (1990) offer a related explanation to the one mentioned above that also builds on the information asymmetry between owners and managers. They focus on performance tilting, i.e. managers concentrate on business areas, which can be easily monitored while neglecting others. An example of this could

be focusing on sales levels instead of training the skills of employees. This is just another form of agency cost; managers try to manipulate the numbers to their advantage. The efficiency of monitoring naturally depends on not only the size of the blockholder's share, but on firm specific factors such as how measurable the production process is, research and development costs and so on. A central element in Zeckhauser's and Pound's model is that current earnings signal future earnings. Shareholders know the state of the world (the distribution of the future cash flows) imperfectly and try to decipher it from the level current earnings. Managers have better knowledge of the state of the world, and have an incentive to manipulate current earnings (as the share price is largely determined by them) at cost to future earnings. A substantial ownership in the company creates an incentive and also allows the large shareholder to review the company's actions in detail. With the presence of such a shareholder, management's incentives to distort earnings are diminished.

Another model on the effect of large shareholders is presented by Shleifer and Vishny (1986), who analyze how large shareholders can improve firm performance by altering firms operating strategy either by negotiating with or by replacing the incumbent management. An important element in their model is that managers maximize profits imperfectly and that large shareholders can find out improvements that the incumbent management is not aware of.[2] However, the large shareholder does not have the control of the firm and has to resort either to informal negotiations, which result in imperfect improvements, or supplanting the incumbent management in a proxy contest or in a direct takeover (acquiring over 50 % of the shares).

Both Zeckhauser's and Pound's (1990) as Shleifer's and Vishny's (1986) models are a step away from the agency model by Jensen and Meckling (1976), as they impose additional restrictions on the ability of the managers. In Jensen's and Meckling's article agency costs arise simply because there is a conflict of interest not on the basis that managers or owners observe the world imperfectly(there is just asymmetry). However, both models can be reconciled with the Jensen and Meckling model as they do not exclude its explanation.

[2]This comes in a form of a probability distribution for finding out improvements at a given cost for the large shareholder

Instead they offer a good reason for the existence of large shareholders.

The question on the effect of large shareholders can also turned upside down: who will monitor the monitors? If large shareholders can monitor the firm's activities efficiently and coerce the management to do their bidding, cannot they also use their voting power to accrue benefits not realized by other shareholders? This is an agency problem similar to the one between managers and owners; the large shareholder has an incentive to acquire private benefits at the expense of the small shareholders. Furthemore, managers in Jensen's and Meckling's (1976) model can also be interpreted to enjoy private benefits of control even though they do not consider the effect of outsiders having voting stock. The private benefits literature extends the potential agency problem to include shareholders as well. The private benefits may include for example, pure monetary payments, higher salaries for board representation or underpriced services and goods for corporate owners. They can also be non-pecuniary, such as control amenities or synergies in production. Insider owners, in turn, could get private benefits from increased discretion over the firm's decisions. Naturally, the individual characteristics of the shareholders and the firm determine the potential for having these private benefits. (Barclay and Holderness 1989 and Bebchuck 1999)

There is a large literature on private benefits, for example Grossman and Hart (1988) have written on the effect of voting structures on private benefits and Barclay and Holderness (1989) discussed them in an empirical context. Pagano and Röell (1998), Bebchuk (1999) La Porta et al. (2002) and Shleifer and Wolfenzon (2002) have published interesting models on private benefits.

Pagano's and Röell's (1998) article is particularly interesting as they analyze the optimal dispersion of shareholders from perspective of company's controlling shareholder. They argue that in countries where the ownership of stock listed companies is concentrated "the main conflict of interest is that between the controlling shareholder and the minority shareholders, rather than between hired managers and the generality of shareholders". (Pagano and Röell 1998, 188) [3] Due to the existence of private benefits, the initial owner

[3]This was already well articulated in Shleifer and Vishny (1997) in their survey of corporate governance around the world.

in their model wants to avoid the overmonitoring by outside shareholders and thus prefers a more dispersed ownership structure. She is not maximizing the firm value, but her utility over the private benefits and firm value much in the same way as the manager in the Jensen and Meckling (1976) model.

Pagano's and Röell's (1998) conclusions are similar to Burkart, Gromb and Panunzi (1997), who analyzed earlier the effect of monitoring to managerial initiative. Pagano and Röell also consider what happens if the entrepreneur and the large shareholder in their model can collude, i.e. for example share the private benefits through monetary payments. They will then maximize their joint utility, which maximizes the firm value if and only if they own it completely.

Bebchuk (1999) has developed a theory of ownership based on the possible private benefit extraction by the controlling owner. He also analyzes the decision of the initial owner, but in contrast to Pagano and Röell (1998) only whether to maintain control or not. Bebchuk shows that this decision depends critically on the size of the potential private benefits of control. When potential private benefits are large, there is an incentive for the initial owner to hold control to capture the benefits and to block possible outsider takeovers. Bebchuck's model futher suggests that in countries where the private benefits of control are large, ownership concentration is much higher than elsewhere. His model then also tries to explain why some countries have low ownership concentration (e.g. the United States) and some high (e.g. Europe), something that Shleifer and Vishny (1997) also pointed out in their survey earlier.

Shleifer and Wolfenzon (2002) connect the private benefits framework to a market equilibrium model, where the level of legal protection of minority shareholders determines the size of the equity market in a country. While Bebchuk's (1999) and Shleifer's and Wolfenzon's (2002) models primarily explain the intercountry differences in ownership structures and equity markets, making the assumption that there are different levels of potential private benefits between firms, private benefits can also explain the variation of ownership concentration between different firms in a country.

The models on private benefits are very interesting for this thesis as they describe the ownership structure (concentrated vs. dispersed) largely as function of private benefits.

Unlike the earlier models by Shleifer and Vishny (1986) and Zeckhauser and Pound (1990) these models suggest a negative relationship with ownership concentration or more precisely voting concentration. Important to note is that performance is decreasing ownership concentration only to a point (half of the votes), especially if the extraction of private benefits is costly (see e.g. Burkart, Gromb and Panunzi 1998). As the controlling shareholder maximizes the sum of the firm value and the value of private benefits at some level of ownership this turns out to be the same as maximizing the firm value as the controlling shareholder bears more and more of the costs of the private benefits. If there is both a monitoring effect and a private benefit effect, we would then expect there to be a non-monotonic relationship between ownership concentration and firm performance. Testing for the existence of private benefits and the monitoring effect is one of the most important tasks for the empirical model.

### 2.2.2 Market for corporate control

The literature on the reasons why large shareholders might matter for firm performance, and especially Shleifer's and Vishny's article, is closely related to the large literature on market for corporate control. The basic idea was already expressed in Manne (1965). To summarize this literature briefly, the basic idea is that the stock market offers mechanisms to takeover poorly performing companies and provides thus a way either to replace the incumbent management with a more efficient one or to merge the firm to with more efficient competitor. Efficiency is here, naturally, understood from the shareholders perspective. The main assumption is that the current stock price signals managerial ability or efficiency. Low stock prices signal poor management and create an incentive for takeovers by more efficient owners. The mere threat of takeovers also helps to curb agency costs as managers know they will be supplanted, if their firm performs poorly enough.

Naturally, the extent of the market pressure on managers also depends on issues such as anti-takeover measures and other factors that help to entrench the incumbent management. One can think that outside takeovers are the most extreme form of the discipline that stock markets force upon managers: if the incumbent shareholders fail to take action to replace an inefficient (signaled by a low share price) outside investors step in. The

ownership structure also is, obviously, a factor to take into account, when assessing the likelihood and the effects of potential takeovers. See for example Grossman and Hart (1980) on this connection, their point is that in an informed market the small owners will demand a price that undoes the potential improvement in performance for the potential bidder.

In a related article to the market for corporate control literature, Stulz (1988) has argued that due to its discouraging effect on possible takeovers, managerial shareholdings have a nonlinear relationship with firm value. In the model by Stulz, the premium paid to get a control over a firm increases, but the probability of the takeover decreases with higher managerial shareholdings. This results in a relationship between managerial ownership and firm value, where firm value first increases and then decreases until the shareholding by insiders reaches 50 %. As performance is usually measured by Tobin's Q, which is market based, this nonlinear effect on the firm value might a significant factor. One can also think the ability to resist takeovers as a private benefit for the insiders.

Although Stulz (1988) focuses on the effect of potential bids, it is possible to argue that higher managerial ownership also lowers firm value through increasing agency costs due to the lower probability for takeovers. This line of reasoning makes the argument more compatible with what has been discussed previously. Stulz' model is important, because it offers an explanation for some observations and together with private benefits further suggests that relationship between managerial ownership and firm performance may be non-monotonic.

### 2.2.3 Managerial compensation

Managerial compensation is also an often mentioned mechanism for controlling agency problems. Equity based compensation schemes are very common in stock listed companies, and derive their justification largely from agency theory. All performance based compensation that aligns the management's and owners' incentives have potential to reduce agency costs, although most of the literature focuses on equity based compensation. Though not directly related to Jensen's and Meckling's model, there is a large optimal contracting literature on solving the problem of an optimal contract (in this case optimal

compensation scheme) between principals and agents. For example, Mirrlees (1974, 1976), Holmström (1979) and Grossman and Hart (1983) have made important contributions in this field. The central conclusion from this literature is that the optimal contracts should be based on the likelihood that the desired actions by the principal were in fact taken by the agent. However, then the set of actions by the agent becomes large, such as is the case with company managers, this "informativeness principle" becomes less important, however, as argued by Holmström (1992). The problem is not simply to make managers work more, but to make them choose more actions that maximize shareholder wealth. In an environment, where the agent's set of potential actions is very large, it is more beneficial to link managerial pay directly to the principal's objective than on measures of agent's actions. Murphy (1998) has a more thorough discussion on executive compensation and the optimal contracting literature.

The problem of designing an optimal compensation contract for a manager can be tied to the agency model by Jensen and Meckling (1976). In fact, Haugen and Senbet (1981) show that by issuing stock options to the management that it is possible for the firm to eliminate the agency costs in Jensen's and Meckling's model entirely. An important part of the result is that the agent receives a call (writes a put) option to buy (sell) the whole firm or a equivalent combination of both call and put options. They also analyze in detail the possible moral hazard problems (incentives to take or avoid risk) that may come with option packages. A long position in call options makes risk taking more attractive, while a short position in put options may make the management to shun risk. Haugen and Senbet show that a combination of put and call options can eliminate both the agency costs and moral hazard generated by the options.

While in reality such packages as described by Haugen and Senbet (1981) are rare, the more common call options with a minimum holding period also have the same potential to limit agency costs as the packages in their model. Options align the incentives of the managers and owners as both parties wealth is tied to the performance of the share price. The agency cost curbing effect of the compensation is naturally depended on its level, the larger the potential share of the manager given by the options the more she will bear of the agency costs. Haugen and Senbet need to give an option to buy to the whole

firm in order to eliminate agency costs in their model. This is quite obvious, as equity based compensation differs from managerial ownership only in that it describes a set of conditions, when managers are entitled to that share. In this regard they are substitutes to each other. Based on these considerations, we would then expect the level of share based compensation to imply lower agency costs and hence improved performance. Naturally, shareholders do not only enjoy the lower agency costs but will have to bear the costs of the compensation programs making the effect more ambiguous. This suggests that managers might benefit more from lower agency costs than equity holders and is fully in line with Jensen's and Meckling's (1976) model, in which the managers enjoy the increase in value achieved by lowering agency costs in full. We see a positive effect on valuation only if the increase in compensation lowers agency costs more than it costs for the shareholders.

### 2.2.4 Managerial labour market

Fama (1980) discusses the effect of managers' reputation and labor market on agency problems. His main point is that there are both internal and external disciplinary measures for the managers that limit agency costs effectively. This applies well to a setting where information is symmetric: all the participants in the labor market know the same set of information. The result of symmetric information is that the managers are effectively disciplined both by internal and external labor markets. Fama's argument is less defendable in the more likely case that information is asymmetric, for example, when the actions of managers are hard to observe by outsiders or when there might be a significant lags between managerial actions and observable results. Fama counters this by arguing that the problem is similar to with the market valuation of the firm itself and "empirical evidence suggests that the capital market generally makes rational assessments of the value of the firm in the face of imprecise and uncertan information."(Fama 1980, 296-297) In terms of the empirical model, an important question is whether this labor market effect is different for each firm or not.

### 2.2.5 Competition in product markets

Competition in the product market has also been seen as curbing agency costs in firms. Hart (1983) shows that competition can reduce managerial inefficiency, when there are a common component to costs for all firms and when there are also entrepreneurial firms besides managerial firms. Market power can, thus, be positively linked to agency costs (managerial slack in Hart's model), while also naturally being very beneficial for firm performance. Other factors that may also affect agency costs such as corporate governance procedures or the composition of board of directors are taken as firm specific factors and do not enter the empirical model. A more thorough discussion how these effects will be controlled is in the empirical section.

### 2.2.6 Concluding remarks

Managers face a large set of contracting relationships that either align their incentives with the shareholders or limit their discretion to take actions that lead to agency costs. The main point of the discussion carried in this section was to demonstrate that there are many alternative mechanisms that limit agency costs. We should then not try to estimate the effects of these mechanisms in isolation, but try to control the heterogeneity that the existence of several alternatives causes. For example, Agrawal and Knoeber (1996), Himmelberg et al. (1999) and Bhagat and Jefferis (2002) argue for the benefits of using this kind of approach in the empirical work. Both managers and owners have sets of actions to choose from to obtain their aims. This naturally present a great challenge for the empirical research, as we need to find ways to control all these factors, but will also support the empirical approach we will later take.

This chapter provided the following hypotheses, holding other things constant, for the empirical research: 1) the existence of a large shareholder can lower agency costs through monitoring and thus increase firm performance, 2) there might be private benefits for controlling shareholders suggesting a non-monotonic relationship between performance and ownership concentration, 3) the level insider holdings might also be nonlinearly related to firm performance and 4) the level of equity based managerial compensation should be

negatively related to agency costs. We will discuss these more with regards to the model we build later. The next chapter summarizes the main approaches and findings of the existing empirical literature on these issues.

# 3 Empirical literature on agency problems and ownership structure

## 3.1 Preliminary discussion on the research and the models

Agency problems between managers and shareholders have been the subject of empirical numerous studies, and there has been an ongoing interest in estimating the effects of ownership structure. Most empirical studies are based only loosely on agency theory, however, and most often involve the analysis of firm performance given some set of variables. Broadly speaking the literature can be divided into two branches: studies that look at changes after a particular event that has altered some agency control mechanism and studies that try to find a relation across firms between the intensity of particular mechanisms and firm performance. In the studies, where ownership structure has featured prominently, the event approach has been used to analyze the effect of, for example, acquisitions or shifts in ownership (e.g. Loderer and Martin 1997 and Cole and Mehran 1997) and dual-class voting structure (e.g. Jarrell and Poulsen 1988). However, as this thesis is more of the second kind, we will focus on the studies analyzing ownership levels and firm performance.

Before going through the literature, it is worthwhile to spend a little time introducing the basic building blocks of the models. As might be guessed, most studies use either cross-sectional or panel linear regressions to uncover a relationship between the various control mechanisms for agency problems and firm performance. Most studies done on the effects of ownership structure only feature it as an independent variable in the performance equation. Some studies, usually the more recent ones, also use simultaneous equations to control for endogeneity of performance and ownership. Performance is likely to affect ownership structure as well as the other way around. Controlling for the possible

endogeneity of the ownership seems to be the right the approach not only in light of the discussion in chapter two, but by some empirical findings as well (Himmelberg et al. 1999 and Demsetz and Villalonga 2001). If performance affects ownership, the single equation regressions with the firm performance as the dependent variable are biased, because the dependent variable is correlated with the error term as it also enters the other side of the equation through the control mechanism variables. Demsetz (1983) was among the first to stress on the fact that ownership is likely to be endogenous relative to performance. Bhagat and Jefferis (2002) on their book on econometrics on corporate governance also strongly advocate for simultaneous equations models to be used for estimating the effects of control mechanisms on performance. This is because there is likely to feedback not only between performance and ownership but from one mechanism to the other, which unless controlled for might bias the results. Despite this most of the empirical literature on ownership structure nevertheless only includes the ownership variable and the performance variable. We will discuss how these are usually measured next.

Performance is most often measured by Tobin's Q, which is defined as the sum of market capitalization of the firm and the value of its debt divided by the book value of its total assets. It represents the ratio of market value vs. replacement cost with a Tobin's Q of 1 representing the equilibrium in capital markets. Higher Tobin's Q can be then intrepreted to signal higher firm value. See, for example, Tobin's (1969) original definition of Q for more details. Some studies also use accounting based measures in addition to Tobin's Q, such as net income to the book value of equity. Demsetz and Villalonga (2001) have a discussion on the difference between these. The main advantage of Tobin's Q is that it is forward looking and market based contrary to the accounting based backward looking measures. The value of equity is also usually more interesting from the shareholders' perspective than pure cash flows.

The use of Tobin's Q is not unproblematic. Demsetz and Villalonga (2001) point out that there is an issue of intangible capital with Tobin's Q, as it is usually calculated with the book value of assets that are not likely to represent value of intangibles correctly. The underlying assumption here is then that revenue is created only using tangible, measurable, capital. The intangibles in contrast consist of assets such as human and intellectual

capital not generally measured in the balance sheet. The omittance of intangibles may introduce a distortion, since firms use differing amounts of intangible capital. However, some studies use variables like advertising costs (brand value) and R&D costs (intellectual capital) to control at least partly for the existence of intangibles. In addition to intangible capital, as Tobin's Q is often calculated using the accounting values for debt and total assets it might then also be affected by accounting practices. Despite these shortcomings, Tobin's Q still is more likely to be a more relevant measure for this study than a profit rate measure. The fact that it uses the market valuation makes it more attractive measure than the alternatives in our case. Fortunately, there is also usually fairly strong correlation between the accounting based measures and Tobin's Q.

Ownership structure is measured by the fraction of shares held by the insiders, by the largest shareholders or both. Insider holdings are used as a proxy for managerial shareholdings and include not only the management team but also the holdings of the board of directors. Their widespread use is probably due to that they are easy to gather from the insider records companies must keep. Another proxy for managerial ownership, and sometimes used, is the CEO's ownership fraction. The insider shareholdings tend to be fairly highly correlated with the measures used for largest shareholders' holdings as they are often members of the board. For example, Demsetz and Villalonga (2001) report a correlation of 0.47. The most often used measure for ownership concentration is the fraction of shares held by the five largest owners, but there are also variations to this. Because the ownership variables are limited to the interval 0 %-100 % they are usually transformed by the logistic transformation, $ln(ownership/((100 - ownership)$, which can be then used in least squares regressions without problems. Otherwise we would have to use limited dependent variable models to explain ownership. The logistic transformation also makes eliminates most of the skewness usually present in the ownership variables.

Naturally, we also need to control for the many differences between the firms. Typical control variables for the performance equations include variables describing the growth prospects of the firms. These include variables that measure the level of investment, such as capital expenditures and R & D costs. Investment has been identified to increase corporate performance (Chan et al. 1990). Other such variables might also include

advertising cost and firm size. The growth aspect is in particular important for regressions involving Tobin's Q as it measures in essence the expected future cash flows relative to value of the firm's assets. Other control variables may include leverage, market power measured by industry concentration (CR4). We will discuss these more later in the context of our own empirical model.

Although the set of controlling variables is usually large, it nevertheless is often not enough to control the heterogeneity in the sample completely. This is usually then at least in OLS models achieved by using dummies for different industries. The dummies capture industrywide effects, but not the (unobserved) heterogeneity between individual firms within the industry, which might also be important. Both ownership and performance are affected by unobservable characteristics, for example Himmelberg et al. (1999) strongly argue that unobserved firm heterogeneity explains large part of the variation in managerial ownership. The fixed effects regressions they use offer a more powerful way to control for individual firm effects. From the discussion in chapter 2, it is clear that in most studies there are several unobserved firm characteristics (in the form of agency control mechanisms and otherwise) that affect the regression results unless somehow controlled for.

The regression models used to describe variation in ownership structure (or the used excluded instruments in two-stage regressions) owe much to the one presented by Demsetz and Lehn (1985), which is in turn partly based on the discussion in Demsetz (1983). They define four different determinants: 1) value-maximizing size, 2) control potential and 3) regulation and 4) amenity potential. The value maximizing size of a firm is easy to understand as a determinant for firm size: the larger the firm needs to be in order to compete efficiently in input and output markets, the greater the cost of holding a given fraction of the firm for an owner. Thus larger firm size should translate to more dispersed ownership. Furthermore, risk aversion should enhance this effect. The second reason Demsetz and Lehn consider, control potential, is related to the potential gains by more effective monitoring by the owners. They define this to depend crucially on firm specific uncertainty, the noisiness of its environment, as this makes monitoring harder. The managers of companies that operate in stable environments (stable technologies, stable

market shares, etc.) are easier to monitor as there are clearer benchmarks to measure their performance. In a fast changing environment, in contrast, it is hard to interpret the effect of managerial actions from exogenous factors. The last determinant of ownership is related to owners obtaining their consumption goals directly through the business of the firm rather than the markets, which may lead them to acquire more control than otherwise. Media and sports firms are good examples of companies, whose ownership might be affected by amenity potential. Demsetz' and Lehn's discussion includes most of the variables used either in instrumental variable estimation or otherwiese in the empirical research since their paper.

Based on the Demsetz and Lehn (1985) article, the ownership regression equations therefore usually include variables such as firm size and share price volatility. Other measures for firm risk characteristics, besides share price volatility, have also been used, for example Demsetz and Lehn use the standard errors of the CAPM betas to proxy for the firm specific risk. Demsetz and Villalonga (2001) also include the CAPM beta to measure market risk. Himmelberg et al. (1999) on the other hand use the volatility of the residuals from the CAPM regression to measure firm specific risk. Keeping the discussion in this section in mind, we can now proceed to analyze the literature.

## 3.2 Empirical studies

Demsetz and Lehn (1985) were the first to study the effect of ownership structure on firm performance empirically. They set out to test the prediction expressed by Berle and Means (1932) that diffuse ownership would adversely affect firm performance. In particular, they analyze the effect of the largest shareholders holdings on performance using a cross-sectional dataset consisting of averages over the period 1976-1980 for their sample of firms. The article is related to an earlier paper by Demsetz (1983), where he argues that ownership structure varies according to value maximization. This is also Demsetz' and Lehn's hypothesis. They measure ownership concentration with three different measures: the share of five largest owners, the share of 20 largest owners and the Herfindahl index. They first estimate a model for ownership, and then use those results to estimate a recursive regression model on firm performance as measured by the profit rate. They

find no relationship between these two, and therefore they reject the Berle and Means hypothesis. The recursive model, i.e. a model estimated with the predicted ownership variable, is used to control for the endogeneity of ownership although, the profit rate does not enter the ownership equation.

Demsetz revisited the issue of his earlier paper with Villalonga (2001), now in a more explicit simultaneous equations setting and also including insider ownership in a separate model. Using two-stage least squares to estimate their system of two equations, one for performance and one for ownership, they find no relationship between ownership structure and performance, but do find that performance (as measured by Tobin's Q) is a negative predictor for ownership concentration. The results for ownership are similar for both blockholders and insiders.

Unlike Demsetz' and Lehn's (1985) and Demzetz' and Villalonga's (2001) papers, most studies on ownership structure have focused more on the effect of insider ownership rather than on large shareholders. In an important paper Morck, Schleifer and Vishny (1988) analyze the effect of insider ownership on firm performance using cross-sectional data in a piecewise fashion. They find a nonlinear relationship with performance, measured as Tobin's Q, first increasing, then decreasing and finally increasing again in the fraction of shares held by insiders. The piecewise regression they performed simply means that they group their ownership variables with certain bounds (e.g. $0\%<x<5\%$) and then regress Q on them. Their results are robust to different specifications, but they do, however, ignore the issue on the endogeneity of ownership altogether. This might bias their estimates.

Morck et al. (1988) also ponder on why Demsetz and Lehn (1985) do not find any relationship between ownership concentration and profitability and conclude that this "is probably due to their use of a linear specification that does not capture an important nonmonotonicity." Demsetz and Villalonga (2001), however, report (using a part of the same sample) that using a quadratic specification does change the results. Morck et al. results are in line with there being significant private benefits in the line of the discussion in the chapter two. These private benefits could for example be in the form of takeover protection for insiders as they discuss in their paper. Morck et al. call the two different effects of insider ownership as the convergence-of-interests hypothesis and the

entrenchment hypothesis.

Many articles have since Morck et al. (1988) contributed to the analysis of the effects of ownership including McConnell and Servaes (1990), Agrawal and Knoeber (1996), Loderer and Martin (1997), Cho (1998), Holderness et al. (1999) and Kapopoulos and Lazaretou (2007). Studies that use panel data, such as Himmelberg et al. (1999) and Hu and Izumida (2008), are especially relevant in their approach for this thesis. Results have remained contradictory.

Table 1 provides a summary of the most important previous research. The table lists the different choices with regards to regressions the authors have made. As already mentioned, nearly all use Tobin's Q, in fact the Demsetz and Lehn (1985) study is the only one not to. Along with Demsetz and Lehn, Hu and Izumida (2008) are the only to not to include insider ownership as a variable. There is not a lot of variation with regards to the control variables, some studies are missing R&D and advertising costs, but this is most likely due to data availability issues. Most of the studies use U.S. data, although the research by Kapopoulos and Lazaretou (2007) and Hu and Izumida (2008) use Greek and Japanese data respectively.

Although the regressions include almost the same sets of variables, there is a significant amount of variation in the results. Some studies (Demsetz and Lehn (1985), Agrawal and Knoeber (1996), Cho (1998), Himmelberg et al. (1999), Demsetz and Villalonga (2001)) find no relation between ownership and performance, while others do (Morck et al. (1988), McConnell and Servaes (1990), Holderness et al. (1999), Kapopoulos and Lazaretou (2007), Hu and Izumida (2008)). What explains this level of divergence in the results? The different results might be in part explained by the fact that some studies only include either an insider (Himmelberg et al. 1999) and some only an outsider (Hu and Izumida 2008) ownership variable and that the datasets are from different countries. Restricting only to the insider ownership studies estimated with data on U.S. companies, there seems to be one important source from which the differences stem: the endogeneity of ownership.

Studies that have not controlled for endogeneity have in general found a relation between ownership and performance. However, the results of these studies are likely to be biased

Table 1: Previous research on the effect of ownership structure on firm performance

| | Demsetz and Lehn (1985) | Morck et al. (1988) | McConnell and Servaes (1990) | Agrawal and Knoeber (1996) | Cho (1998) | Holderness et al. (1999) | Himmelberg et al. (1999) | Demsetz and Villalonga (2001) | Kapopoulos and Lazaretou (2007) | Hu and Izumida (2008) |
|---|---|---|---|---|---|---|---|---|---|---|
| Regression type | OLS, recursive | OLS | OLS | OLS, 2SLS | OLS, 2SLS | OLS | Panel fixed effects, IV | OLS, 2SLS | OLS, 2SLS | Panel VAR, 2SLS |
| Performance variables | Profit rate | Profit rate, Tobin's Q | Tobin's Q | Tobin's Q | Tobin's Q | Tobin's Q | Tobin's Q | Profit rate, Tobin's Q | Profit rate, Tobin's Q | Profit rate, Tobin's Q |
| Ownership variables | Outside | Inside | Both | Both | Inside | Inside | Inside | Both | Both | Outside |
| Other controlling mechanisms | No | No | No | Six mechanisms | No | No | No | No | No | No |
| Endogeneity | Yes | No | No | Yes | Yes | No (separate) | Yes | Yes | Yes | Yes |
| Nonlinearity (private benefits) | No | Yes, piecewise | Yes, (piecewise) | Yes (for insiders) | Yes, piecewise | Yes, (piecewise) | Yes, piecewise | No | No | Yes |
| **Control variables** | | | | | | | | | | |
| Firm Size | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Capital expenditures | Yes | No | No | No | Yes | No | No | Yes | No | No |
| R&D costs | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | No | Yes |
| Advertising costs | Yes | Yes | Yes | Yes | No | No | Yes | Yes | No | No |
| Debt ratio | No | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | No |
| Market power | CR4 concentration ratios | No | No | No | No | No | Yes, proxy | CR4, for a smaller sample | Yes, CR4, Hindex | Yes, CR3 |
| Other | Dummies for different industries | Dummies for different industries | Dummies for different industries | Regulated industry dummy for ownership | Dummies for different industries | Dummies for different industries | Fixed firm effects, also industry and year effects | Dummies for different industries | Utilities, Financial and Media firm dummies | Dummies for different industries and years |
| **Results** | | | | | | | | | | |
| Performance | No relationship | Nonmonotonic relationship | Nonlinear relationship | No relationship | No relationship | Nonlinear relationship | No relationship | No relationship | Concentration a positive predictor | Nonmonotonic relationship |
| Ownership | Dependend on firm specific risk | - | - | CEO tenure positive predictor | Tobin's Q is a positive predictor | Market value negative predictor | Firm risk a negative predictor | Tobin's Q is a negative predictor | Tobin's Q is a positive predictor | Investment and risk negative predictors |
| Sample | Averages over 1976-1980, 511 firms | 1980, 456 Fortune 500 firms | 1173 firms for 1976 and 1093 for 1986 | 1987, Forbes 800 383 firms | 1991, 326 Fortune 500 firms | NYSE listed firms, 1935: 571 , 1995: 1370 | 1982-1992, 600 (at start) Compustat firms | Averages over 1976-1980, 223 firms | 2000, 175 Greek listed firms | 1980-2005, 715 TSE manufacturing firms |

as performance is likely to affect ownership. As a further argument for this, Himmelberg et al. (1999) confirm in their sample using a conditional moment test (defined akin to the Hausman (1978) test) designed to test whether the variable for insider shareholdings correlates with the unobserved firm fixed effect. The results seem to confirm that there is indeed endogeneity in their sample. Some of the other studies listed in table 1 have found that performance is a significant predictor for ownership. As all the studies are relatively similar in the data and the approach they use, it would seem safe to assume that this endogeneity affects all the models rendering the results, where ownership is treated simply as exogenous, invalid.

Interestingly, Himmelberg et al. (1999) find that there is still a (nonlinear) relationship between Q and insider shareholdings even when they control for the endogeneity using instrumental variable estimation. The results are rendered insignificant only when they control for firm fixed effects. This is true for both the instrumental variable estimation and the standard OLS model suggesting that unobserved heterogeneity between firms might bias the results more significantly than endogeneity. Himmelberg et al. (1999) do raise the question whether controlling for firm fixed effects is necessary in the instrumental variable estimation (which controls for one source of unobserved firm effects) and get confirming evidence from using a Hausman test, but conclude in the end that the result is likely due to the low power of the test.

The discussion by Himmelberg et al. (1999) is in line with the conclusions reached in chapter two. If firms choose among alternative control mechanisms and these are not taken into account explicitly, we would expect to see significant unobserved firm heterogeneity. The unobserved firm characteristics are likely to be even more important, if, for example, the nature of the decision process influence agency costs as suggested by Jensen and Fama (1983). In sum, this suggests that future research should be based on methods that can take this heterogeneity into account. Most of the studies listed in table one have controlled for industry effects using dummies, which might also control for unobserved firm characteristics given that these characteristics correlate within industries. While this is indeed likely to the case at least to some extent, the fixed effects regressions used by Himmelberg et al. (1999) seem to offer a better way in controlling the heterogeneity. The

firm fixed effects should control for the differences between firms not picked up by the observed variables.

Agrawal's and Knoeber's (1996) article is interesting, because it is one of the few trying to model several agency control mechanisms at the same time. They estimate the effect of insider shareholding, large blockholders, outside directors, debt policy, the managerial labor market and the market for corporate control. They argue in line with Demsetz (1983) and others that the use of a mechanism will be increased until marginal costs and marginal benefits are equal. A cross-sectional model, which properly accounts for the interdependency of these mechanisms, should therefore not find any relationship between them and firm performance except when significant external effects exist. By external effects they mean, for example, the loss of diversification an owner suffers when investing a large amounts of capital to one company. Their results largely confirm their argument, the only mechanism to show an effect in a simultaneous equations model is the number of outside directors, which affects performance adversely. They account this to political reasons; firms under political constraints may find it necessary to add politicians, environmentalists, and so on to their boards.

The study by Holderness et al. (1999) is interesting in that they have data concerning managerial ownership from the time Berle and Means (1932) were writing, from 1935 to be precise, which they compare to more contemporary dataset from 1995. While they use similar methodology to McConnell and Servaes (1990) that suffers from likely endogeneity bias, the data show that managers owned 1995 more of their companies stock than in 1935 and that this higher managerial ownership seems not to have substituted other control mechanisms. The claim by Berle and Means that the future would belong to more dispersedly owned firms seems to not to have come about.

Hu and Izumida (2008) have a wide and long panel dataset at their disposal, which sets them apart from the other studies. It allows them to estimate a panel vector autoregression (VAR) model with two-way (firm and time specific) fixed effects and perform Granger causality tests. The fact that ownership structure might affect performance over time has not been explored in many studies, although Demsetz et al. (1985, 2001) have used four year averages for their variables. Hu and Izumida find statistically significant positive

relationship between Tobin's Q and one year lag of ownership concentration (10 and 5 largest owners) even when controlling for endogeneity with generalized method of moments (GMM) estimation. The Granger causality tests further (whether change in $x$ predicts a change in $y$) confirm that changes in ownership concentration are followed by changes in firm performance. However, the bivariate setting Hu and Izumida use is susceptible to bias due to omitted variables. They therefore also estimate a panel simultaneous equations model (with contemporaneous variables) with industry dummies, which largely confirms the earlier results. Their research then suggests that ownership structure affects performance both contemporaneously and with a lag of one year. As could be expected, ownership concentration is quite stable in their sample and highly correlated with its lags.

An important observation from previous research for the empirical model is that in almost in every study that a relationship between ownership structure and firm performance has been found it has been nonlinear of nature. Kapopoulos and Lazaretou (2007) make an exception, but this might simply stem from the fact that they do not take nonlinearity into account. Many studies have used the same piecewise regression by Morck et al. (1988), but have, however, usually not been able to find exactly matching nonlinear shape for the relationship on performance. For example, McConnell and Servaes (1990) find that managerial entrenchment is an issue only at markedly higher levels of ownership than Morck et al. (1988). Another common method for detecting a nonlinear relationships fitting a quadratic form, which has been also used to confirm the existence of nonmonotonicity (e.g. McConnel and Servaes 1990, Hu and Izumida 2008). While the issues with endogeneity and unobserved firm characteristics many of these studies fail to address make the results questionable, it would still seem important to include a way to test for the possible existence of private benefits in the empirical model.

There have also been other studies on the existence of private benefits. Nenova (2003) finds that there are significant private benefits in a number of countries through calculating the value of control-block votes (derived in Nenova 2001) for dual class firms. However, the benefits she finds in the case of the Finnish companies are small in comparison to most other countries. Maury and Pajuste (2005) approach the issue from the perspective of multiple large shareholders, or more precisely the contestability of the major shareholders

power, and find for a Finnish dataset that that when the distribution of votes is more equal for large shareholders, the firm value tends to be higher. Their results suggest that the existence of other large shareholders limits the extraction of private benefits compared to a single large owner. While the details of these studies are omitted as they represent another branch of research, the results seem credible and are widely cited. The results underline the need to test for the existence of private benefits further.

An interesting observation is that the results on ownership concentration reported by Kapopoulos and Lazaretou (2007) differ from the ones reported by Demsetz and Villalonga (2001), although the two studies estimate almost identical models. Kapopoulos and Lazaretou obtain a positive and statistically significant relationship between ownership concentration and performance while Demsetz and Villalonga do not. This might explained by institutional factors, as the institutions of corporate governance in Greece are likely to be different from those in the United States. The fact that Hu and Izumida (2008) also find a statistically significant relationship in the Japanese data lends more credibility for this explanation, as does a study by Mueller and Spitz (2002)on the effect of insider ownership in small and middle sized (non-listed) German companies. Mueller and Spitz find a nonmonotonic relationship even when controlling for endogeneity.[4] The effect of institutions on corporate governance has been a focus in the private benefits literature with many interesting results (e.g. Shleifer and Vishny (1997) and Nenova (2003)) and while do not so much discussed in the studies focused on the structure of ownership, is likely to be an important factor. This is something to think on when interpreting the results of the empirical model presented in this thesis.

Finnish data have been used in related research, but there has not been a study that would have analyzed the relationship between ownership structure and performance in the spirit of the studies presented in table 1. As mentioned, Maury and Pajuste (2005) have analyzed the effect of contestability of largest shareholders power by other large shareholders. Pajarinen and Ylä-Anttila (2006) have also analyzed Finnish ownership data on the basis of different groups of owners rather than ownership levels. There is

[4]The Mueller and Spitz (2002) study is markedly different from the other studies presented in this section in the regard that they use a sample of non-listed companies and measure performance based on surveys on company performance. Because of this, it is omitted from table 1.

also a study by Ekholm and Maury (2009), who explore the relation of owner incentives and stock returns and find that concentrated ownership in a firm (versus the rest of the portfolio) is positively related to the operating performance of the firm. The study by Bhattacharyaa and Graham (2009) is an example of studies focused on different investor types: they estimate the effect of institutional ownership on firm performance. Their results are in line with Maury and Pajuste (2005), more equal institutional ownership is positively related to performance while the concentration of institutional ownership is not. While the results of these studies are interesting, the approach taken in this thesis this is of more general nature.

The hypotheses sketched out in the end of chapter two seem not have survived the empirical tests well. While some studies have identified a positive relationship between ownership concentration and firm performance, the results have dissappeared after controlling for endogeneity. Kapopoulos and Lazaretou (2007) and Hu and Izumida (2008) make an exception, as both identify a statistically significant relation between ownership structure and performance. Some of failures to find a relationship can, however, be intepreted not as empirical rejections of the principal-agent model, but simply to arise from the use of cros-sectional regression. If managers and outside owners optimize their ownership according to other agency control mechanisms and unobservable characteristics, the results of cross-sectional OLS regressions should not show a significant relationship with insider ownership as Agrawal and Knoeber (1996) point out, but just optimal responses to the unobservable characteristics of the firms.

# 4 Empirical part

## 4.1 Data and variables

The data used in this study consist of annual ownership and financial data for 105 non-financial listed companies in the Helsinki Stock Exchange (NASDAQ OMX Helsinki) during the years 2007-2009. The data have been gathered from annual reports of the companies, Thomson Financial Worldscope and Thomson Financial Datastream data ser-

vices. ETLA also contributed by supplying a dataset on Finnish companies that included approximately 90 largest listed firms. This section provides a concise overview of the used data and variables and possible caveats related to the data.

The sample of companies in the data represents a diversity of companies in terms of industries, growth prospects, and of course ownership structure. The sample of firms includes the most prominent and largest Finnish companies. The data are a balanced panel for 2007–2009, as all companies that had missing data were dropped to rule out the possibility that the shorter time span for some companies would influence the results in such a short panel. Furthermore, dealing with balanced panels makes some of the estimations more straightforward. It should be noted that the time span, obviously, coincides with a severe recession in the Finnish and world economy with a significant reduction in equity values. All in all, with 105 firms and three years there are 315 observations in the sample. Although this is this still a rather low number, it is not that far off from many of the comparable studies listed in table 1.

The ownership data were collected from the annual reports of the companies and typically includes the ten or so largest registered owners. Foreign owners usually do not register their holdings, but hold in their stock in nominee registers instead (mostly due to tax benefits), which causes some problems in interpreting the ownership data. While nominee registered shares do not have a right to vote, they can be registered in advance for shareholders meetings, which then gives them the right to vote thus making them the type of owners we might be interested in as based on the discussion in chapter 2. This means that there is then is a possibility that the used ownership data do not include all the largest shareholders and thus might show a lower concentration of ownership than what is really the case. However, the Finnish law mandates all owners with greater that 5 % ownership share to flag their holdings making this a smaller problem than what it might seem first. All foreign owners that own more than 5 % of a company should then be in the data.

Based on the collected data, the ownership concentration is then measured by the ownership share of the largest owners or alternatively by the five largest shareholders. The first measure is particularly unaffected by the problem created by nominee registers as

Table 2: Descriptive statistics of ownership concentration

| Variable | Mean | Median | Std. Dev. | Min. | Max. | Abbreviation |
|---|---|---|---|---|---|---|
| Largest owner | 21.74 | 17.80 | 15.12 | 0.38 | 77.39 | - |
| Logistic transformation | -1.53 | -1.53 | 1.01 | -5.57 | 1.23 | eq |
| Voting share of the largest owner | 26.10 | 21.30 | 18.84 | 0.38 | 78.14 | - |
| Five largest owners | 42.94 | 43.30 | 19.50 | 1.54 | 92.76 | - |
| Logistic transformation | -0.35 | -0.27 | 0.98 | -4.16 | 2.55 | eq5 |
| Voting share of the five largest | 49.18 | 49.45 | 23.13 | 1.54 | 97.81 | - |

the largest owner typically has much greater share than 5 %. In fact, the mean for the largest owner is approximately 22 %. Both measures were transformed using the logistic transformation $ln(ownership/((100 - ownership))$ to make their use, especially their instrumentation, simpler in least square regressions.

Table 2 provides a summary of the ownership data including the voting shares of the largest owners. An important observation is that the ownership concentration is very high for our sample of companies, with the five largest owners having a mean of 43 % ownership share. Even the median is over 40 %, although there is significant variation in the ownership share. The fact that the mean for the largest owner is more than 20 % (i.e. half of the share of the 5 largest) tells us that there usually is one single owner holding significantly more than the rest. The data also include around 30 companies, which have two classes of stocks and therefore the ownership and voting shares differ from each other. The ownership levels are clearly higher than those reported, for example, by Demsetz and Villalonga (2001).

Management ownership stake is proxied by the insider holdings by the board of directors and the management team as is the case in the most of the other studies. As the Finnish law mandates the publication of insider holdings, these data are available for all companies. It was collected along with the ownership data from the annual reports of the companies, but was in some cases also supplemented by data provided by company websites (Affecto, Finnlines and Panostaja), where the details provided by the annual reports were found deficient. Because the insider data also include the board members

Table 3: Descriptive statistics of insider ownership

| Variable | Mean | Median | Std. Dev. | Min. | Max. | Abbreviation |
|---|---|---|---|---|---|---|
| Insider holdings | 13.81 | 4.90 | 18.14 | 0.00 | 67.60 | - |
| Logistic transformation | -3.56 | -2.97 | 2.87 | -16.12 | 0.74 | m |
| Insider voting share | 16.09 | 5.34 | 21.12 | 0.00 | 85.07 | - |

who usually either are or represent the largest shareholders, it raises the question whether it really proxies managerial shareholdings or something else. The correlation between the five largest shareholders and the insiders holdings was rather high (0.55) and somewhat lower with the share of the largest owner (0.41), but by no means are these measures equivalent in the light of the data. Other studies have primarily used insider rather than managerial ownership, so the problem is not limited to this study. As with the ownership concentration measures, the share of insider ownership was transformed using the logistic transformation.

Table 3 gives a summary of the insider ownership variables. We can see that the level of insider ownership is usually much lower than ownership concentration with a mean of 14 %, but there is also signicant variation across the sample. The mean is relatively high, but for example Himmelberg et al. (1999) report a higher number for their sample. The median ownership is significantly lower than the mean, implying that there is a large number of companies with very low insider ownership (the distribution is highly skewed).

The financial data of the companies were acquired from the Thomson Financial Worldscope data service. The acquired data include the common accounting measures from companies financial statements, such as sales, total assets, total debt, market capitalization, capital expenditure, research and development expenditure, intangibles in balance sheet and so on. These are then be used to calculate different descriptive ratios for the firms. Table 4 provides an overview of these variables including all three possible firm size variables, we might want to include in our model: sales, assets and market capitalization. All three are good alternatives and correlate highly (around 0.85) with each other. All numbers in the table are in millions of euros.

Table 4: Descriptive statistics of firm financials (in millions of euros) and Tobin's Q

| Variable | Mean | Median | Std. Dev. | Min | Max | Abbreviation |
|---|---|---|---|---|---|---|
| Sales | 1748 | 225 | 5144 | 2 | 51058 | s |
| Capital Expenditure | 81 | 6 | 201 | 0 | 1433 | - |
| Total Assets | 1752 | 175 | 4852 | 4 | 37619 | a |
| Property, Plant and Equipment | 528 | 32 | 1594 | 0 | 12855 | - |
| Total Debt | 435 | 38 | 1103 | 0 | 7500 | - |
| Intangible Capital | 1131 | 35 | 9291 | 0 | 100968 | - |
| Market Capitalization | 1615 | 152 | 7094 | 3 | 101995 | - |
| R&D Expenditure | 60 | 2 | 480 | 0 | 5144 | - |
| R&D Dummy | 0.71 | 1 | 0 | 0 | 1 | - |
| Tobin's Q | 1.25 | 1.01 | 0.77 | 0.35 | 5.02 | Q |

We will use Tobin's Q as a measure of performance in the empirical model. As discussed in chapter 3 it is most likely the best alternative. Nevertheless, the possible shortcomings of the measure must be acknowledged as discussed in chapter 3 (Demsetz and Villalonga 2001). As in many other studies (e.g. Demsetz et al. (1985) and (2001), Himmelberg et al. (1999)) the replacement cost of capital was assumed to be adequately measured by the book value of assets, and thus Tobin's Q was calculated as sum of the market value of common and preferred stock and the book value of debt divided by total assets. Although, the book value of total assets probably does not equal the replacement cost, we have few better alternatives. The Tobin's Q for the sample shows significant variation from 1, as table 4 demonstrates, pointing to, perhaps, to significant amounts of intangible capital in the firms. The median is near one, though. The distribution of the calculated Tobin's Q resembles closely the log-normal distribution.

Different financial ratios can be used to measure firm characteristics to control for the observable differences between firms. Table 5 lists the calculated ratios including a few alternatives we might be interested in. The capital and research expenditures are important, because they can be used to capture the differences between the investment rates and growth opportunities across firms. Research and development spending can also in part account for the existence of intangible (intellectual) capital as was already discussed

Table 5: Descriptive statistics of financial ratios

| Variable | Mean | Median | Std. Dev. | Min | Max | Abbreviation |
|---|---|---|---|---|---|---|
| R&D to Assets | 0.04 | 0.01 | 0.09 | 0.00 | 0.92 | rd |
| Capex to Fixed Assets | 0.31 | 0.21 | 0.40 | 0.01 | 3.81 | cx |
| Fixed Capital to Assets | 0.23 | 0.18 | 0.19 | 0.01 | 0.86 | f/a |
| Fixed Capital to Sales | 0.25 | 0.14 | 0.35 | 0.00 | 2.53 | f/s |
| Intangible Capital to Fixed Capital | 4.65 | 0.75 | 12.22 | 0.00 | 130.32 | i/f |
| Sales to Fixed Capital | 15.54 | 6.97 | 26.81 | 0.39 | 306.76 | s/f |
| Debt to Assets | 0.27 | 0.26 | 0.21 | 0.00 | 1.53 | d/a |
| Debt to Market Capitalization | 0.72 | 0.33 | 1.28 | 0.00 | 9.30 | d/m |
| Operating Income to Sales | -0.01 | 0.05 | 0.49 | -6.24 | 0.34 | o/s |

in chapter 3. A problem with the R&D expenditures was that a significant number of companies did not report them. This was solved by assuming that the expenditures were zero in line with how Himmelberg et al. (1999), for example, deal with the issue of missing values. Since small research and capital expenditures are likely to be the reason for not reporting the figure in the first place, this should not bias the results too much. Solely focusing on firms that report the research and development expenses, would tilt the sample heavily towards research and development intensive firms and should be thus avoided. This would also significantly reduce the sample size.

Leverage and other capital structure measures are used to account for the differences in the capital structure across firms. The leverage measures, debt to assets and debt to market capitalization were calculated by divinding the book value of debt by the book value of total assets or alternatively by the market capitalization. As discussed in the previous chapters, leverage is important, because it influences managerial incentives and higher levels of debt can also attract more intensive bondholder monitoring.

Fixed capital ratio was calculated by divinding the book value of property, plant and equipment by the book value of assets or alternatively the value of sales. The amount of fixed capital measures the relative importance of hard capital in firm's production as opposed to intangible capital, which is likely harder to monitor (Himmelberg et al. 1999).

In terms of ownership, a higher level of fixed capital might translate to lower managerial ownership levels, if we, for example, follow Gertler's and Hubbard's (1988) argument.

There is also a ratio of intangibles, as they are reported in the balance sheet, to fixed capital to measure the relative importance of intangible capital in the firm's production. An important thing to note here is that the intangibles reported in the balance sheet represent, as a general rule, only acquired assets and do not include internally generated intangible capital (IAS38). Thus, it should be interpreted more as a control variable not necessarily able to capture the effect of intangible capital. Whether this is a viable way for controlling the amount of intangibles, depends on the reported intangibles correlating with the internally generated intangibles. The amount of acquired intangibles can, of course, also have an effect on firm performance irrespective of its relation to internally generated intangibles.

Table 5, finally, also has the ratio of operating income to sales, also known as the operating margin. It is meant to capture differences in the firm's pricing power and free cash flow. Higher operating margin, naturally, means that the firm is retaining more of its sales for itself. While it also measures the health of the company, it tells us something about how much the firms can charge for their products with regards to costs. Thus higher profit margins point to more pricing power and less competition for the firm and could therefore be used as a proxy for market power. Naturally many factors affecting operating income regardless of the firms pricing power can blur this relationship. While market power means higher profits for the firm, less competition can also mean more agency costs as discussed (Hart 1983). Operating income should also correlate with free cash flow, as Himmelberg et al. (1999) argue meaning again possibly greater agency cost (Jensen 1986).

Stock price data for the companies were acquired from the Thomson Financial Datastream data service. The data consist of daily prices for all the 105 companies and the stock index for all the listed companies in the Helsinki Stock Exchange. The data were used to estimate the capital asset pricing model, i.e. the returns of the individual stocks were regressed on the market returns. For more details on CAPM, see for example Bodie, Kane and Marcus (2007). The estimation of CAPM was done on weekly values rather than on daily values as some of the stocks have very low liquidity (especially during summer

Table 6: Descriptive statistics of firm risk variables

| Variable | Mean | Median | Std. Dev. | Min | Max | Abbreviation |
|---|---|---|---|---|---|---|
| Beta | 0.62 | 0.56 | 0.40 | -0.79 | 2.11 | beta |
| Sigma | 0.25 | 0.28 | 0.07 | 0.10 | 0.34 | sigma |
| SE of Beta | 0.19 | 0.17 | 0.09 | 0.06 | 0.70 | se_beta |
| Volatility | 0.41 | 0.38 | 0.18 | 0.13 | 1.66 | vol |

months) and the prices may not move at all and may thus be missing. The problem with the use of nonsynchronous data in estimating CAPM is well documented (Scholes and Williams 1977). The weekly values help offset this.

The CAPM betas are used to measure the market, or systematic, risk of the companies with goal of using it to explain ownership patterns. The beta does show a negative correlation with the ownership concentration and insider ownership variables. If investors are risk averse, this is what we would expect to see. The CAPM model was also used to estimate the volatility of the CAPM residuals to measure the idiosyncratic risk of the companies following Himmeberg et al. (1999). As discussed in the literature section, Demsetz and Lehn (1985) claimed that more idiosyncratic risk might increase chances for managerial discretion and scope for improvement and thus could lead to higher ownership levels. There is of course also a negative side to idiosyncratic risk as higher levels of it imply less portfolio diversification. The simple correlation to the ownership variables is positive.

The standard errors of the CAPM betas, used by Demsetz and Lehn (1985), and the stock price volatility were also acquired as alternative risk measures. Table 6 provides the descriptive statistics. We will need the risk variables later in explaining, or more precisely instrumenting, the ownership variables.

Data on managerial equity based compensation were gathered from the annual reports of the companies. More specifically, the data consist of the annual expenses for the option and share-based compensation programs as reported by companies in the notes to financial statements. This is defined as the cost the shareholders incur from the equity

compensation and is mandated to be reported by IFRS 2. Why use this figure? While most companies do offer a good deal of information on executive compensation, the measures they use tend to vary from firm to firm. For example, the year-end market value of the equity based compensation or the potential share of equity resulting from equity compensation could be preferable to the pure cost measure. Unfortunately, quite a number of companies do not report them directly and calculating them from details of the different compensation programs would entail simply too much work for this thesis. Hence, we use the incurred cost reported in the financial statements. A few more words on this are probably needed.

The cost of equity based compensation is based on an estimated fair value of the compensation scheme and the period over which this cost should be recognized, also known as the vesting period. Vesting period usually lasts until the instruments mature or the compensation program ends. At the grant date, i.e. when the scheme is launched, the company estimates how many options will be exercised (or how many shares given) and divides this over the vesting period usually either in equal shares or then based the maturity of the used instruments. The fair value of options is usually calculated by either using the Black and Scholes option pricing formula or the binomial method. The difference between the actual and estimated cost is adjusted during the vesting period. The difference arises from the number of instruments granted and exercised and the change in the market value (these two are, naturally, linked).

The picture is described above is blurred by the fact that companies have much leeway in estimating the costs generated by the compensation and the fact that they use several different compensation methods besides strictly shares and options that make the valuation somewhat harder. Several companies have purely synthetic compensation schemes based on share price performance and other criteria. The valuation of the schemes, which usually last several years is quite sensitive to the initial conditions aggravating the problem of fair valuation. The timing of the schemes also (i.e. when they are launched) affects the incurred expenses and this problem is made worse by the fact that we use of annual data instead of averages over a longer time period. Despite the possible problems, the valuations and incurred costs have been taken at face value.

Table 7: Descriptive statistics of incurred expenses (in millions of euros) from equity based compensation

| Variable | Mean | Median | Std. Dev. | Min | Max | Abbreviation |
|---|---|---|---|---|---|---|
| Incurred expenses | 2.10 | 0.11 | 14.07 | -16.80 | 236.00 | - |
| Expense to Market Cap | 0.0027 | 0.0008 | 0.0063 | -0.0039 | 0.0566 | c |

The cost of the equity based compensation packages, as described above, does not represent the market value of such instruments but rather the paid equity compensation during that year plus change in the market value. The market value would tell us how much the managers have at stake in their compensation; the cost tells us approximately how much they have at stake during that year. While these two are likely to be highly correlated they are not the same thing. It is, therefore, somewhat unclear how exactly we should interpret the incurred cost, although it should measure relatively well the level of equity based compensation compared to other firms.

Naturally when we put a compensation variable into a regression model, we come across the endogeneity problem here as in the case of the relationship between performance and ownership. We would expect performance to affect compensation greatly.

Table 7 provides a summary of the compensation data with the incurred expenses in millions of euros. The regressions use a variable, which measures the cost of compensation as a share of market capitalization, i.e. incurred expenses divided by the market value of the firm.

## 4.2 Methodology

### 4.2.1 Fixed effects models

Most of the previous research has used cross-sectional regressions to analyze the relationship between ownership and performance. We will use a fixed effects model akin to Himmelberg et al. (1999) and Hu and Izumida (2008). This section goes through the method and discusses its major advantages over the cross-sectional approach. The

following is largely based on Baltagi (2008) and Greene (2003).

The data used in this study consists of individual firms over time, as described, and this offers the possibility of controlling the unobserved heterogeneity between individuals with panel data methods. The form of panel data is such that there are $i = (1, \ldots, N)$ individuals and $t = (1, \ldots, T)$ time periods. The fixed effects model is based on the assumption that unobserved differences between individuals can be captured by differences in a constant term. We therefore include an individual specific term for each individual $i$ in the model. This means that instead of writing the regression model in the classical form (with double subscripts due to the use of panel data):

$$y_{it} = \alpha + x_{it}'\beta + u_{it} \tag{1}$$

we write it as:

$$y_{it} = \alpha + x_{it}'\beta + \mu_i + u_{it} \tag{2}$$

where $y_{it}$ is the dependent variable, $\alpha$ the intercept term, $\beta$ the coefficient vector, $x_{it}$ the vector of independent variables (regressors) and $u_{it}$ the error term. In the case of the fixed effect model, there is an additional individual effect, $\mu_i$, which varies across individuals $(i = 1, \ldots, N)$. This is simply a fixed constant effect for each individual in the sample allowing us to control for unobservable individual characteristics. As we will shortly see in more detail, using the constant individual effects means that we are restricting ourselves to estimating the effects of changes within the individuals (e.g. changes ownership levels). Everything else is held constant by the individual effects. Our results are, therefore, conditional on the set of individuals in the sample. (Baltagi 2008)

In the case of this thesis, the sample restricts us to making inferences only on the Finnish non-financial listed companies over the period of 2007 - 2009. Furthermore, we cannot estimate the effect of any time-invariant individual characteristics, for example, the effect of industry, with the fixed effects model. For our purposes this is perfect: we are interested in variables that change over time not how time-invariant characteristics affect them, i.e. we want to estimate how an increase in the insider ownership or ownership concentration affects Tobin's Q holding the characteristics of the firms constant.

There is a long discussion in the econometrics literature on whether to use fixed or random effects, the other main candidate for panel data, estimation. The data used in this study naturally lends itself to a fixed effects model as we are using a very particular sample of firms. The random effects model requires that the individual effects are not correlated with the regressors, but for our case it is easy to believe that many of the unobservable characteristics we are trying to control might be also correlated with the observable characteristics. (Baltagi 2008)

Despite having a strong bias for the fixed effects model beforehand, we can use the Hausmann (1978) specification test to decide whether fixed effect or random effects model is more viable. While not wishing to kill the suspense, it is perhaps best mentioned outright that the fixed effects model presented in the section (4.3) soundly rejects the Hausman test. Furthermore, the regressors show a strong correlation with the individual term. The results can be found in the appendix I. Thus, concentrating on fixed effects estimation is well justified not only ex ante, but also in light of the data.

The fixed effects model can also include time effects by adding time dummies $\lambda_t$ (making our inferences conditional on time as well) for different periods. This also called a two-way fixed effects model:

$$y_{it} = \alpha + x_{it}'\beta + \mu_i + \lambda_t + u_{it} \tag{3}$$

There are now $N + T$ number of dummy variables in our model, one for each individual $i = (1, \ldots, N)$ and time period $t = (1, \ldots, T)$, which makes it computationally very consuming if $N$ or $T$ is large. Because of this, $\beta$ is most often estimated using deviations from the means eliminating the individual effects from the regression altogether. In either case, we need to arbitrarily restrict $\sum_i \mu_i = 0$ and $\sum_t \lambda_t = 0$ otherwise the model suffers from perfect multicollinearity we cannot estimate the individual effects or the error terms. To see that using these restrictions we can indeed estimate $\beta$ from the demeaned data, let's first average the model over time:

$$\overline{y}_i = \alpha + \overline{x}_i'\beta + \mu_i + \overline{u}_i \tag{4}$$

With $\overline{y}_i = T^{-1} \sum_t y_{it}$ and $\overline{x}$ and $\overline{u}_i$ are similarly defined. $T^{-1} \sum_t \lambda_t = 0$ as defined above. Note that the individual effect, $\mu_i$, does not change over time. Similarly, averaging over

individuals gives

$$\overline{y}_t = \alpha + \overline{x}_t'\beta + \lambda_t + \overline{u}_t \tag{5}$$

And averaging over both time and individuals ($\overline{y} = T^{-1}N^{-1}\sum_i \sum_t y_{it}$) gives:

$$\overline{y} = \alpha + \overline{x}'\beta + \overline{u} \tag{6}$$

This is needed for estimating $\alpha$. Turning our attention to acquiring an estimator for $\beta$, we can now subtract the averages over time and individuals to eliminate the individual and time effects:

$$(y_{it} - \overline{y}_i - \overline{y}_t) = (x_{it} - \overline{x}_i - \overline{x}_t)'\beta + (u_{it} - \overline{u}_i - \overline{u}_t) \tag{7}$$

The OLS estimator for $\beta$ can then be derived in the usual way from the first order conditions. After this, an estimator for $\alpha$ can then be recovered from (6) and after that $\mu_i$ from (4) and $\lambda$ from (5). The transformation we made above, estimating $\beta$ from the variation around the means, is also called the within transformation and the fixed effects estimator is also known as the within estimator.(Baltagi 2008 and Verbeek 2008) We will use within transformation to estimate our model in the next section.

From (7) it is obvious that in fixed effects estimation we are only capturing the effect of the variation in the variables in $x$ within the individuals $i$. To put this differently, the model captures the difference between $y_i$ and $\overline{y}_i$, but is not even trying to explain why $\overline{y}_i$ is different from $\overline{y}_j$. Thus the results depend on both the included variables and the individuals, and in the case of time effects also on the time period. All-time invariant characteristics are wiped out by the within transformation, and so are all time effects common to all individuals, if we include them. A feature of the within transformation is that the individual effects are not needed in the estimation of $\beta$ (in which we are principally interested in), and thus do not affect its biasedness in the case of, for example, endogeneity problems (e.g. if the individual effects are endogenous relative to performance). (Baltagi 2008 and Verbeek 2008)

If the error term in the model described above is the classical disturbance term (see e.g. Greene 2003 for more details) and (2) is also the true model, OLS will yield the best

linear unbiased estimator. The unbiasedness of $\beta$ requires that $x_{it}$ are independent of $u_{it}$. Consistency requires only that the expectation is equal to zero, i.e. $E((x_{it} - \overline{x}_{it})u_{it}) = 0$. Note that with fixed effects the regressors can, and usually do, correlate with the individual effects without violating the conditions for consistency or unbiasedness. (Baltagi 2008)

Not surprisingly the advantage of fixed effects model over the cross-sectional lies in the individual effects we introduced to the model. They allow us to control for unobserved firm characteristics as long as these characteristics are independent of time. Such characteristics might be in the case of persons intelligence, for example, or organizational culture in the case of firms. The point that these characteristics must be time-invariant must be stressed, individual effects stay the same throughout the estimation period. As we achieve the elimination of the individual effects, and thus an estimator for $\beta$, through demeaning the data, the effects will not capture anything that varies from one time period to another. On the other hand, all effects over time that are common to all firms, i.e. effects that do not vary across firms but vary across time, will be controlled by the time effects, $\lambda_t$. Both time and individual effects offer a powerful way to control unobserved time and individual characteristics. (Baltagi 2008)

Compared to pure cross-sectional models the two-way fixed effects model then offers two advantages: 1) a way to control for unobserved heterogeneity across firms and 2) a way to control time effects common to all firms. How important these advantages are, naturally, depends on the characteristics of the used data.

### 4.2.2 Instrumental variable methods

The endogeneity of an independent variable, a correlation between a regressor and the residuals, will bias the results of a standard OLS regression and produce inconsistent estimates as is evident from the consistency requirement laid out for the estimator for $\beta$. Ro control for endogeneity, we need instrumental variable methods. The idea of instrumenting is that we have an instrument that correlates highly with the endogenous right hand side variable, but does not correlate with the error term, which can then be used to explain the variable we want to instrument variable. The use of instruments allows us to determine the true relationship between the endogenous variables, which is

otherwise impossible as they both affect each other.

Baltagi (2008) offers a good overview of the current panel data methods that can be used to estimate more than one equation, or equations with endogenous variables on the right hand side. The basic idea is first to regress the variable we are instrumenting on the instruments to obtain the fitted values, which can then be used in the second stage regression on the equation we interested in estimating. If we are estimating a true system of equations, with all endogenous variables explicitly modelled, we could also estimate the equations a third time. While the system estimation provides more accurate estimates from the data we have, the drawback is that it is also more prone to misspecification (in addition to some computational complexity). Like many comparable studies, we will use the simpler two-stage least squares (2SLS) approach. Baltagi (1981) has derived a 2SLS estimator for fixed effects models.

To begin, let's specify a system equation we are interested in estimating. This means defining endogenous variables explicitly in terms of endogenous and exogenous variables. This is not necessary and we will not define such a system in our own empirical model, but it helps to see our problem and its solution more clearly. The following are also known as the structural form equations of the system:

$$\begin{cases} y_1 = Z_1\delta_1 + Z_{\mu_1}\mu_1 + u_1 \\ y_2 = Z_2\delta_2 + Z_{\mu_2}\mu_2 + u_2 \end{cases} \tag{8}$$

where $Z_j = [Y_j + X_j]$ with $j = (1, 2)$ being the equation we are referring to. $Y_j$ is the set of the endogenous variables that enter in the right side in equation $j$ and $X_j$ is the set of exogenous variables in equation $j$. In this case we can set $Y = [Y_1, Y_2]$ and $X = [X_1, X_2]$ that contain all the endogenous and exogenous variables in the system. Note that the individual terms in the model are now written in vector form with ${\mu_j}^T = [\mu_{ji} \cdots \mu_{jN}]$. The residuals, $u_j$, are defined similarly. The matrix $Z_{\mu_j} = I_N \bigotimes \tau_T$ is composed of zeros and ones defining the individual dummies for each individual with $I_N$ defined as an identity matrix of dimension $N$, $\bigotimes$ the Kronecker product and $\tau_T$ as a vector of ones. The dimension of $Z_{\mu_j}$ is $NT$ due to the fact that we are using the Kronecker product. (Baltagi 2008)

We could easily add the time effects to the model as well; we would then just be having two-way error component model, but the resulting estimator for $\delta_1$ would be the same. Our approach for finding an estimator for $\beta$ would not change. (Baltagi 2008)

Baltagi (1981) proceeds from (8) by making the within transformation, i.e. wiping out the individual effects by using $Q = I_{NT} - P$, where $P = I_N \bigotimes \overline{J}_T$ with $\overline{J}_T$ being a matrix of ones with dimension T divided with T, i.e. consisting of $1/T$ T times T. From the construct of matrix P, it is relatively easy to see that it produces an average over time for each individual and when we combine it to $Q = I_{NT} - P$ we get the differences from the averages over time. This is exactly what we want. If we multiply, for example, the first equation of (8) with Q we get:

$$Qy_1 = QZ_1\delta_1 + QZ_{\mu_1}\mu_1 + Qu_1 \tag{9}$$

Noting that $P$ is in a fact a projection matrix on $Z_{\mu_j}$, since $P = Z_{\mu_j}(Z_{\mu_j}'Z_{\mu_j})^{-1}Z_{\mu_j}' = I_N \bigotimes \overline{J}_T$ and that for a projection matrix $PZ_{\mu_j} = Z_{\mu_j}$, we can set $QZ_{\mu_1} = I_{NT}Z_{\mu_j} - PZ_{\mu_j} = Z_{\mu_j} - Z_{\mu_j} = 0$. We have thus eliminated the individual effects and have:

$$Qy_1 = QZ_1\delta_1 + Qu_1 \tag{10}$$

We could now use (10) to derive the fixed effects estimator as in (7). However, as the system (8) suffers from endogeneity this estimator would be biased and inconsistent due to the correlation between endogenous regressors and the residual term. We must, therefore, instrument the endogenous variable first, before we can derive the estimator.

To simplify the notation, let's define $Qy_1 = \tilde{y}_1$, $QZ_1 = \tilde{Z}_1$ and $Qu_1 = \tilde{u}_1$. We can now turn to instrumenting the equation with $X = [X_1, X_2]$ instruments for the set of $Y_1$ endogenous variables in the right hand side of equation 1. In a system of equations like the one we have, deciding which instruments to use is easy, since we can by definition use all variables included in $X_2$ not included in $X_1$. It should be clear that in order to solve the system there must be at least one exogenous variable in equation 2 that is not in equation 1 for each endogenous variable in $Y_1$. Let's denote the transformed instruments as $\tilde{X} = QX$, and if we then apply 2SLS to solve the issue with endogeneity on (10) we get: (Baltagi 1981)

$$\tilde{X}'\tilde{y}_1 = \tilde{X}'\tilde{Z}_1\delta_1 + \tilde{X}'\tilde{u}_1 \tag{11}$$

Solving the first order conditions yields us the fixed effects (within) 2SLS estimator for $\delta$:

$$\tilde{\delta}_{1,2SLS} = (\tilde{Z}_1' P_{\tilde{X}} \tilde{Z}_1)^{-1} \tilde{Z}_1' P_{\tilde{X}} \tilde{y}_1 \tag{12}$$

where $P_{\tilde{X}} = \tilde{X}(\tilde{X}'\tilde{X})^{-1}\tilde{X}'$ is the projection matrix for $\tilde{X}$. Essentially what (11) accomplishes is that it first regresses $\tilde{Y}_1$ on $\tilde{X}$, containing all the variables in the system (8), obtaining the fitted $\hat{Y}_1 = \tilde{X}\hat{\beta}_2$ and then regresses $y_1$ on $\hat{Y}_1$ and $\tilde{X}_1$. The resulting estimator is called the fixed effects 2SLS (or within 2SLS) and it can be interpreted as we would the standard fixed effects estimator. It is consistent under the usual OLS conditions and when the instruments for the endogenous variables are relevant, i.e. correlated enough with $Y_1$, uncorrelated with $u_1$ and not a linear combination of elements in $X_1$. We will discuss this issue more in the context of the estimated model. (Baltagi 1981, Baltagi 2008, Greene 2003 and Verbeek 2008)

Based on this section it should know be quite clear what we are set to estimate in the empirical section. The equations in (7) and (11) provide the framework for the estimation. It also should be clear now that to control the bias introduced by endogeneity, we need instruments that are exogenous to the performance variable but correlate highly with the ownership variables. The next section discusses the estimated models and their results.

## 4.3 The estimated model and results

### 4.3.1 The model

We will first go through the estimated model before proceeding to the estimation results. The preceding discussion on the theory, the previous empirical research and the acquired data have already pointed to the central features that our model should and can include. In terms of previous research, the models by Himmelberg et al. (1999), Demsetz and Villalonga (2001) and Hu and Izumida (2008) are especially interesting. Their specifications are, despite some methodological differences, quite combatible with the variables we have in our use.

We want to regress Tobin's Q on all the possible variables that influence its value such as intangible capital, investment and growth prospects. We also want to control for the var-

ious agency control mechanisms discussed in chapter 2, including leverage, compensation, competition and of course ownership structure, which we want to include in a quadratic form to the potential for private benefits into account. Building on this and following the methodology presented in the previous section, our fixed effects model for Tobin's Q can be specified as follows:

$$\begin{aligned} Q_{it} =& \alpha + [eq_{it}\ m_{it}\ c_{it}\ {eq^2}_{it}\ {m^2}_{it}\ a_{it}\ (d/e)_{it}\ cx_{it}\ rd_{it}\ (i/f)_{it}\ (s/f)_{it}\ (o/s)_{it}]'\beta \\ &+ \mu_i + \lambda_t + u_{it} \end{aligned} \tag{13}$$

The model consists of 12 variables in total, in addition to the constant, individual effects and time effects terms. It includes, in one form or another, nearly all the possibly relevant variables for Q available in the dataset. This general approach is arguably the best, since bias due to omitted variables is a magnitude greater problem than the imprecision caused by irrelevant variables. Let's go through the model variable by variable.

The inclusion of the largest owner's ownership share, $eq_{it}$, and the insider ownership share, $m_{it}$, are naturally obvious as they are the variables of greatest interest. As discussed beforehand, the regression model uses the logistics transformations of these variables. Their quadratic terms allow us test and control for a possible nonlinear relationship to Q, which is well justified in the light of previous findings of nonmonotonicity and on the discussion of private benefits in chapter 2. The quadratic specification is advantageous over the piecewise specification by Morck et al. (1988) in that the turning point is endogenous instead of being specified in advance (McConnell and Serveas 1990).

We have opted to use the variable for the largest owner to measure the ownership concentration here rather than the five largest, $eq5_{it}$, because it less affected by the potential bias caused by nominee registers. It is also less correlated with $m_{it}$ than the five largest owners (helping to separate effect of these two), but still very highly correlated with the five largest owners (0.83). The inclusion of the compensation term, $c_{it}$, also self-explanatory as we want to test the effect of equity based compensation on firm performance.

Firm size is controlled by the book value of its assets, $a_{it}$, and is important, because larger firms can generally be thought to have less growth opportunities than smaller firms. Following the argument by Himmelberg et al. (1999) larger firms may also suffer

from larger monitoring and agency costs. On the other hand, larger companies may also enjoy economies of scale and greater market power compared to smaller firms. In any case, it is important that we control for the effects of size.

Leverage is measured by the debt to market value ratio, $(d/e)_{i_t}$, which measures the relative importance of debt financing and was found to be more sensitive in regards to Q than the close alternative, debt to assets. We could have used either. As discussed in chapter 2, debt can mitigate the agency conflicts between shareholders and managers and attract bondholder monitoring, but also gear managers to more risk taking. However, since we are measuring the value of debt by its book value, this greater risk taking should not necessarily translate to a lower Q. In fact, more risk taking could boost equity values or at least the option value of equity. We would then expect the effect of leverage to be positive.

The model includes capital expenditures to the existing stock of plant, property and equipment, $cx_{it}$, to measure the level investment to new fixed assets. The research and development expenditure to assets, $rd_{it}$, measures the level r&d investment in the firm. Their effect on Q through growth (and possibly intangibles) has been discussed before. The model also includes the amount of intangible capital to fixed capital, $(i/f)_{i_t}$, which is used to control for the effect of intangibles on Q. As discussed, this variable does not capture the internally generated intangibles, only the acquired, making its interpretation more difficult.

The sales to property, plant and equipment ratio, $(s/f)_{i_t}$ is also included in the model. This is the inverse of the fixed capital to sales ratio, which can be thought to account for the effect of the more easily monitored fixed capital. The inverse naturally has an opposite interpretation, the smaller the amount of fixed capital the higher the value and thus the harder it is to monitor the production of the firm. The use of the inverse as we will later see frees us one possible instrument in the instrumental variable estimation, so we will use it rather than the direct ratio. Finally, the model also includes the operating income to sales, $(o/s)_{i_t}$, to proxy for market power.

Despite that we have quite a large set of variables in the model, there are still many factors that are controlled only by the individual effects, $\mu_i$. Relating to the discussion

carried in chapter 2, we can see that the model is missing at least variables for the market for corporate control and managerial labor market. Some corporate governance or board structure variables could also be argued to be important but missing. Provided that these are mostly time-invariant, which might well be the case for a sample length of just three years, the individual effects can control their effect on Q. The individual effects also control for possible industry effects, usually achieved with industry dummies. In addition, individual effects control for the many unobserved firm characteristics that might affect agency costs and Q such as organizational structure, culture, diffuseness of relevant information, managerial ability etc. as discussed in chapter 2. The underlying assumption here again is that these characteristics must stay stable, which is probably a good working assumption over a period of just three years. Including the individual effects seems in this light very important as pointed throughout this thesis, as they provide a far more powerful way to control observable and unobservable firm characteristics than the often used industry dummies. Time dummies, $\lambda_t$, are also included to control any time effects common to all firms, such as the general decline in the equity values during 2008. Their use can be similarly defended, and come with a relatively small cost of two additional variables to be estimated.

All in all, the model described by (13) is resembles closely to what has been used in the previous literature as well. This is, of course, natural as there are only so many ways of describing such a relation from a limited set of variables. It should also make the comparisons between other studies and this easier, in case there are significant differences in the results. The unique feature of the model in (13) is that it includes variables for insider ownership, ownership concentration and equity based compensation in the same equation. We will first present the results from the fixed effects estimation without controlling for endogeneity and then turn our attention to results from instrumental variables estimation.

Table 8: Estimation results on Q using fixed effects estimation

| Variable | Abbrev. | Coefficient | Std. Err. | p-value |
|---|---|---|---|---|
| Largest Owner | eq | 0.4453 | 0.1670 | 0.008 |
| Insider Ownership | m | 0.1374 | 0.0596 | 0.021 |
| Equity Based Compensation | c | -7.1733 | 5.9405 | 0.227 |
| Largest Owner$^2$ | $eq^2$ | 0.1319 | 0.0398 | 0.001 |
| Insider Ownership$^2$ | $m^2$ | 0.0066 | 0.0275 | 0.016 |
| Total Assets | a | -0.0001 | 0.0000 | 0.026 |
| Debt to Market Capitalization | d/e | 0.0756 | 0.0259 | 0.004 |
| Capital Expenditure to Fixed Capital | cx | 0.4567 | 0.1215 | 0.000 |
| R&D Expenditure to Assets | rd | 4.2877 | 0.4016 | 0.000 |
| Intangible Capital to Fixed Capital | i/f | -0.0084 | 0.0020 | 0.000 |
| Sales to Fixed Capital | s/f | 0.0075 | 0.0020 | 0.000 |
| Operating Income to Sales | o/s | -0.0147 | 0.1022 | 0.886 |
| Number of Observations | 315 | | R2 | 0.637 |
| F(14,196) | 46.48 | | P>F | 0.000 |

### 4.3.2 Fixed effects estimation

The model in (13) was estimated using the fixed effects estimation method described in section 4.2.[5] Table 8 reports the model diagnostics, coefficients, standard errors and corresponding p-values excluding the constant and individual and time effects. The reported standard errors are robust to heteroscedasticity (see e.g. White 1980). Before analyzing the results, we should of course remember that we are not controlling for the possible endogeneity of ownership, which means the estimates could be significantly biased. We should, therefore, analyze the results with a grain of salt.

The estimation results show positive and statistically significant coefficients at the 95 % confidence level for both the largest owner's and the insider ownership share. The quadratic terms are also positive and significant for both ownership variables, and indicate that the relationship between ownership and performance is nonlinear but monotonic. Thus higher levels of insider ownership or ownership concentration increase firm perfor-

[5]Estimations were done using the xtivreg2 package, which is in turn based on the ivreg2 package, for Stata.

mance according to our model. If we differentiate Q in regards to the ownership variables to find out the exact shape of the relationship, we find that the turning point is negative and that the second derivative is positive.[6] This means that the effect of ownership on Q increases at an increasing rate. The estimation results also show that the effect of ownership concentration to be greater than the effect of insider ownership.

Interesting to note is that the largest owner coefficient is sensitive to the removal of the squared term, as estimating (13) without the quadratic terms yields a statistically insignificant coefficient for the largest owner, but not for the insider ownership variable. See appendix I for these results.

The estimation results do not support the claim of there being substantial private benefits of control in the case the Finnish companies as the effect of ownership on firm performance stays positive even at higher levels of ownership. Higher levels of ownership do not bring adverse effects for the other shareholders. The results regarding private benefits are in line with Nenova (2003), who reported small private benefits of control for Finnish companies, but somewhat contradictory to results by Maury and Pajuste (2005), although the models results are not comparable as such, since they estimate the effect of more equal ownership within the largest owners.

The estimation results with treating ownership purely as an exogenous variable seem then to confirm the agency theory hypotheses laid out in chapter 2: both ownership concentration and insider ownership have a positive effect on firm performance. The monitoring and incentive effects dominate the extraction of private benefits. The effect of equity based compensation is somewhat of an exception, as its coefficient is not significantly different from zero and is in fact negative. Equity based compensation, at least as measured by incurred expenses, does not then seem to increase firm performance. We will discuss this more later.

Turning our attention to the model as a whole, table 8 shows that the F-test is highly significant indicating that the model does explain the variation in Q substantially. Indeed, most of the variables are statistically significant. In addition to compensation, the largest

[6] Since $\frac{\partial Q}{\partial eq} = 0.4453 + 0.2638eq = 0 \Leftrightarrow eq = -\frac{0.4453}{0.2638} = -1.688$ and $\frac{\partial^2 Q}{\partial eq^2} = 0.2638 > 0$
and correspondingly $\frac{\partial Q}{\partial m} = 0.1374 + 0.0132eq = 0 \Leftrightarrow m = -\frac{0.1374}{0.0132} = -10.4$ and $\frac{\partial^2 Q}{\partial m^2} = 0.0132 > 0$

surprise is that higher amounts of intangible capital relative to fixed capital, as reported in the company financials, have an adverse effect on Tobin's Q. This might be because the use of fixed capital is more easily monitored, but as the ratio of sales to fixed capital is positive and highly significant, it does not seem likely. If the use of more fixed capital would be beneficial to firm performance in itself, we would expect sales to fixed capital to be have a negative coefficient. As the reported intangibles include only acquired intangible capital, perhaps the negative coefficient captures some of the effect corporate acquisitions on firm value involving large amounts of intangibles during 2007-2009. On the other hand, the effect might be purely explained by the fact that these intangibles are already captured by our Tobin's Q and if there is no significant correlation between them and the internally generated intangibles, their effect on Q might well be negative. This especially true, if it indeed is so that higher levels of intangible capital mean that the firm production is harder to monitor as Himmelberg et al. (1999) suggest.

The estimation results show a negative and significant effect for firm size, as measured by total assets, on Tobin's Q. As discussed before, this might be due to smaller growth prospects for larger firms. However, substituting total assets with market capitalization or sales seems to suggest that the coefficient is sensitive to used the measure. For example, we substitute total assets by sales as a measure for firm size, firm size is highly insignificant. This is somewhat perplexing considering that they correlate highly (0.88) with each other. Other coefficients are unchanged. The fit of the model is, nevertheless, better with total assets than with sales.

Leverage, as expected, has a positive effect on Tobin's Q according to the results in table 8. This is either due to its effect on mitigating the conflict of interest between managers and owners or then higher risk taking, in the form of leverage, helps to increase equity values as discussed earlier. The explanations naturally do not exclude each other. Capex and R&D investments are also highly significant and have a positive effect on Q as expected.

The coefficient for the operating income to sales ratio, our measure for market power, is highly insignificant. This most likely caused by it not properly proxying for firm market power, as there is good reason to believe that it should enhance firm performance. Although not reported in table 8, it should be also noted that the time dummies are also

highly significant validating their inclusion.

What about the residuals? Are they the classical residual terms as discusssed in section 4.2.1? The independence of residuals across individuals, or firms in our case, can be tested using Pesaran's (2004) cross-sectional dependence test. The idea of the test builds on Breusch and Pagan's Lagrange multiplier test, but allows estimation even when $N > T$, which is a problem for Breusch's and Pagan's test. Rather than using the *squared* pairwise correlation of the residuals, Pesaran suggest a test based on simply the pairwise correlations, which allows to define the test so that it is relatively free of size distortions even in a small sample. The details of the test can be found in Pesaran (2004). The test results show a rejection of the null of cross-sectionally independent residuals at the 95% level.[7] The test result is reported in Appendix I. This places the estimates in table 8 into question.

In addition to the Pesaran's test for cross-sectional dependence, the Woolridge (2002) test for serial correlation of the residuals rejects null of no serial correlation.[8] This means the residuals are correlated not only across individuals but across time as well. We could correct the bias caused by this two-way clustering of the residuals by using the Thompson (2009) standard errors, but this would be in vain since there is another problem with the residuals.

A simple histogram of the residuals from the model instantly tells that they are non-normally distributed. This graphic evidence can be formalized by using, for example, the D'Agostino test, which rejects the normality on the grounds of skewness and kurtosis.[9](D'Agostino, Belanger and D'Agostino 1991) This renders the t- and F-tests invalid and makes it impossible for us to interpret whether the coefficients are statistically significant or not.

The distribution of residuals is skewed to the positive side and also shows spikes at the center and to the far left of the distribution. The distribution might converge to the normal distribution with larger samples, but since the non-normality is severe we cannot be sure

[7]The test was performed using Stata's xtcsd package that employs Pesaran's test.

[8]The test is available for Stata in the xtserial package.

[9]Stata's sktest command was used perform the test.

of this. While there might be a host of reasons why the distribution is non-normal, the scatter plot on Q and the residuals suggest the most important reason is the failure of the model to describe the very large values of Q (there is a faint pattern with larger residuals with larger Q). This suggests a quite natural solution to the problem. Taking a logarithmic transformation of Q will transform its distribution from log-normal to normal eliminating the outliers from the distribution. It reduces the skewness as the distances between large values of Q become smaller while the distances between lower values Q become larger as they are now expressed through the exponents of $e$, the Napier's constant.

Even after using the logarithm of Q, we are still able to interpret the coefficients in the usual way as the only difference is that Q is now in the logarithmic scale, i.e. a $ln(Q)$ of 2 equals $e^2 \approx 7.389$. So instead of estimating (13), we now estimate:

$$\begin{aligned} ln(Q_{it}) =& \alpha + [eq_{it}\ m_{it}\ c_{it}\ {eq^2}_{it}\ {m^2}_{it}\ a_{it}\ (d/e)_{it}\ cx_{it}\ rd_{it}\ (i/f)_{it}\ (s/f)_{it}\ (o/s)_{it}]'\beta \\ &+ \mu_i + \lambda_t + u_{it} \end{aligned} \tag{14}$$

There is nothing mysterious in this transformation, as the model in (14) can be transformed back to terms of Q by raising both sides of the equation to the power of $e$. To put it differently, an increase of one unit in a variable in the right hand side of equation (14) will result an increase of $e$ to the power of the coefficient in Q.

Table 9 reports the estimation results for equation (14) using the log of Q rather than Q as the dependent variable. The standard errors are robust to heteroscedasticity.[10]

After the transformation of Q the tests on residuals do not detect non-normality, cross-sectional dependence or serial correlation. As there is no significant correlation across time or firms we need not use clustered standard errors. Heteroscedasticity is still present, but we have corrected for its presence by using heteroscedasticity robust standard errors. See appendix I for the test results.

Being now relieved of the problems troubling the residuals, we can be now safe in our interpretation of the results in table (9) just keeping in mind that the effect of the variables is now to the logarithm of Q. We can in a glance see that the F-test is even more highly significant than in (13), confirming at least to some degree that our model fits

[10]Estimations were done using Stata's xtivreg2 package.

Table 9: Estimation results on ln Q using fixed effects estimation

| Variable | Abbrev. | Coefficient | Std. Err. | p-value |
|---|---|---|---|---|
| Largest Owner | eq | 0.2429 | 0.1222 | 0.047 |
| Insider Ownership | m | 0.0972 | 0.0313 | 0.002 |
| Equity Based Compensation | c | -8.4866 | 4.8719 | 0.082 |
| Largest Owner$^2$ | eq$^2$ | 0.0804 | 0.0299 | 0.007 |
| Insider Ownership$^2$ | m$^2$ | 0.0044 | 0.0016 | 0.005 |
| Total Assets | a | -0.0001 | 0.0000 | 0.028 |
| Debt to Market Capitalization | d/e | 0.0412 | 0.0262 | 0.108 |
| Capital Expenditure to Fixed Capital | cx | 0.1788 | 0.0874 | 0.041 |
| R&D Expenditure to Assets | rd | 1.8008 | 0.2800 | 0.000 |
| Intangible Capital to Fixed Capital | i/f | -0.0685 | 0.0015 | 0.000 |
| Sales to Fixed Capital | s/f | 0.0473 | 0.0015 | 0.001 |
| Operating Income to Sales | o/s | 0.0919 | 0.0606 | 0.130 |
| Number of Observations | 315 | | R2 | 0.669 |
| F(14,196) | 49.66 | | P>F | 0.000 |

the transformed Q better. The scatter plot on the residuals and $ln(Q_{it})$ looks also more random than without the transformation. Plotting the residuals against the independent variables shows no clear patterns either.

The main results of model in (13) still hold: the share of the largest owner and the share of the insiders have a positive effect on Q. Furthermore, the squared terms are also significant and positive. The conclusions of the above discussion then apply here as well. The largest owner's ownership share has a larger effect on Q than insiders' ownership. The effect of ownership seems to increase at an increasing rate for higher levels of ownership.[11] As we now know we have no problem with the residuals, the agency theory hypotheses regarding the effect of ownership are thus confirmed by our estimation results (with ownership as exogenous).

The most surprising change in the results is that the coefficient for compensation is now almost significant with a p-value of 0.082. Keeping in mind that the sample size is not

[11] Since $\frac{\partial Q}{\partial eq} = 0.2429 + 0.1608eq = 0 \Leftrightarrow eq = -\frac{0.2429}{0.1608} = -1.51$ and $\frac{\partial^2 Q}{\partial eq^2} = 0.1608 > 0$
and correspondingly $\frac{\partial Q}{\partial m} = 0.0972 + 0.0088eq = 0 \Leftrightarrow m = -\frac{0.0972}{0.0088} = -11.05$ and $\frac{\partial^2 Q}{\partial m^2} = 0.0088 > 0$

that large and we would not necessarily expect to be all coefficients to be significant at 95% level, this seems to suggest, treating ownership and compensation exogenous, that higher levels of equity based compensation have a negative effect on Q! This is contrary to our hypothesis. As we sketched in chapter 2, equity based compensation should align managers' and owners' incentives and thus enhance firm performance. However, there are a number of reasons why we might get a nearly significant and negative effect. First of all, we are not controlling for the endogeneity of compensation, which might bias the results substantially. Furthermore, we are conditioning our estimation on the time, years 2007-2009, which was highly turbulent time.[12] Yet, whether this is enough to cause a negative reaction seems somewhat far-fetched. Thirdly, the used measure, incurred expenses to market capitalization, might be wrong as discussed in the data section. It might not properly measure the stakes managers' have through their equity based compensation in the company. This is, however, hard verify without additional data. Then again, it might also be that compensation really has an adverse effect on Tobin's Q.

Although this beyond the topic and scope of this thesis, it is perhaps good to mention that there are at least a few studies pointing to possible negative effects of executive compensation. We already discussed in chapter 2 that the effect might be somewhat ambiguous (even on equity values), since shareholders also bear the cost of compensation. Bebchuk and Fried (2003), for example, make an argument that executive compensation might actually be part of the agency problem and Bebchuk, Cremers and Preyers (2010) offer recent evidence that higher share of CEO pay relative to other executives might be associated with lower corporate value.

Other changes in the results include that in the transformed model leverage no longer has a statistically significant impact on Q. On the other hand, the operating income to sales ratio is now much more significant. The changes in the significance levels stem from the fact that the relationship between the transformed Q and the variables is not the same as Q an the variables in (13). To have such clear changes in the significance levels, tells us that the relationship between these variables and Q is sensitive to the functional form. This also is behind the change in the compensation coefficient. In (14) the form of the

[12]However, financial firms are not in the sample.

relationship is $ln(Q_{it}) = \alpha + \beta x_{it} <=> Q_{it} = ce^{\beta x_{it}}$ instead of just a linear one like in (13).

Comparing the results in table 9 to previous research, we find a few differences. The robustness of the relationship between the ownership structure variables and Q is somewhat surprising, because for example Himmelberg et al. (1999) report that in their quadratic specification the managerial ownership terms are only significant, when they use a pooled model. They report that the variables lose their significance using either fixed or industry effects even without controlling for endogeneity. Considering that their sample size is almost ten times larger, it is then surprising that our sample shows such a highly significant relationship between Q and insider holdings and one that is robust to changing the functional form of the relationship from Q to logarithm of Q. All in all, the results in table 9 are more in line with the studies using other than U.S. data, leading naturally to think that there might be some institutional factors relative to the U.S. that explain the difference between results. The extraordinary time period, 2007-2009, could also be a factor, if one is willing to believe that it has altered the underlying behavior of the managers and owners. Nevertheless, since we have not taken into account the possible bias introduced by the endogeneity of ownership, it is perhaps a little too early to draw too strong conclusions.

### 4.3.3 Instrumental variables estimation

We have not yet tried to control for the endogeneity of ownership in regards to performance. This section presents results from instrumental variables estimation using the method described in section 4.2.2 We must start from trying to find good instruments for the endogenous variables. Looking at the model in (14) (since $ln(Q_{it})$ seemed to work better), we need to instrument at least the largest owner's share of ownership as well as the insider ownership variable and their squared terms. In addition, the variable for compensation is also likely suffer from endogeneity bias, so we need to instrument it as well. This brings the number of variables to be instrumented to five, and we therefore need at least five variables exogenous to Q, i.e. not correlated with the error term, but that correlate highly with $eq_{it}$, $m_{it}$ and $c_{it}$.

A natural place to start looking for potential instruments for the ownership variables are the CAPM risk variables, which should have an effect on ownership as suggested by Demsetz and Lehn (1985). Indeed, this was the reason why we calculated them in the first place. Therefore the measures for firm systematic risk, beta, and idiosyncratic risk, sigma and the standard error of beta, naturally arise as potential candidates for instruments.

Previous research also suggest firm size to be an important determinant for ownership, which suggest that one of the firm size measures might be used as an instrument. However, as size also potentially affects Q we must be careful of not introducing bias due to the use of an invalid instrument. Himmelberg et al. (1999) argue in their article that since the capital and research and development expenditures already control for the firms' growth prospects, firm size could be used as an instrument for ownership. They also use it in their analysis. Following their argument and noting that annual sales was found not to be significant as an alternative for total assets, one can make the case for using annual sales as an instrument for ownership. As the logarithm of sales correlates more highly with the variables to be instrumented, we will use it rather than the direct figure.

The discussion in the data section pointed out that capital structure matters for ownership patterns, and especially that the amount of fixed capital might translate to lower levels of managerial ownership (Gertler and Hubbard 1988). As we already control the effect of fixed capital on performance through the inverse of fixed capital to sales ratio, this suggests that we might also use one of the fixed capital ratios, either to assets or to sales, as an instrument.

Besides firm performance variables themselves, the compensation variable was found to correlate most highly with the same variables that might also explain ownership. This is logical as one can view equity based compensation as an alternative for managerial ownership.

All in all with three risk variables, firm size and a fixed capital measure (two alternatives for this), we have the total of five instruments that we need. Table 10 reports the pairwise correlations of the possible instruments with the ownership and compensation variables.

We can immediately see from the table that the most of the correlations with instruments

Table 10: Pairwise correlations of potential instruments for ownership and compensation

| | Abbrev. | beta | se_beta | sigma | f/a | f/s | ln(s) |
|---|---|---|---|---|---|---|---|
| Largest owner | eq | -0.14 | 0.12 | 0.13 | 0.20 | 0.23 | -0.19 |
| Insiders | m | -0.34 | 0.03 | 0.19 | -0.25 | -0.33 | -0.50 |
| Compensation | c | -0.03 | 0.19 | 0.10 | -0.22 | -0.14 | -0.17 |
| Beta | beta | 1.00 | 0.12 | -0.47 | 0.04 | 0.04 | 0.55 |
| SE Beta | se_beta | | 1.00 | -0.25 | -0.14 | -0.09 | -0.28 |
| Sigma | sigma | | | 1.00 | -0.01 | 0.00 | -0.29 |
| Fixed capital to assets | f/a | | | | 1.00 | 0.75 | 0.33 |
| Fixed capital to sales | f/s | | | | | 1.00 | 0.25 |
| ln(sales) | ln(s) | | | | | | 1.00 |

and the variables we want to instrument are quite low. Only the logarithm of sales stands out as a good potential instrument, and only for insider ownership. The variables for the ownership share of the largest owner and the equity based compensation do not show particularly high correlation to any of the potential instruments. Since we have a lack of good variables explaining the variation in compensation and it is more highly correlated with the fixed capital to assets ratio, choosing it rather than the fixed capital to sales ratio seems a better alternative. Our set of the instruments outside the model in equation (14) then includes beta, sigma, logarithm of sales, standard error of beta and fixed capital to assets. Naturally, as shown in the section on instrumentable variable estimation (4.2.2), the ownership variables and compensation will be regressed on all the variables of equation (14) (excluding total assets) and the instruments.

The low correlations between the instrumented and instruments pose a serious problem as it may mean that the instruments are too weak to properly explain the variation in the instrumented variables. Nevertheless, the set of instruments in table 10 present the best possible variables that can be argued to be exogenous to Q but to correlate strongly with the ownership variables. There are a few variables that correlate more highly with the ownership variables, but it is hard to argue for them to be exogenous relative to Q, and their use as instruments would then defy our purpose. For example, the share of nominee registered shares, which correspond to the share of foreigner ownership in the firm, has a relatively high negative correlation with both ownership concentration and

insider ownership, but it is hard to argue it be be completely indenpendent of Q. Foreign ownership tends to concentrate on the better performing firms (see for example Pajarinen and Ylä-Anttila 2006). Using the lags of the ownership variables as instruments, as Maury and Pajuste (2005) do, would eliminate a third of the sample, so it is not a plausible option either with the sample we are using.

We will use formal tests on the instruments alongside the regressions to determine whether they are relevant for the instrumented variables. For some of the tests (namely the Hansen J test) we will need an extra instrument, and one is provided by squaring the beta and allowing the relationship to systematic risk to be nonlinear. We could have used a square of sigma or both of the fixed capital measures instead of one, but both of these alternatives produce worse estimates.

Table 11 reports the 2SLS regression results on the model described by (14), excluding total assets, (on $ln(Q_{it})$) using the set of instruments described above. The reported standard errors are robust to heteroscedasticity.[13]

Table 11: Instrumental variable estimation results - ownership and compensation endogenous

| Variable | Abbrev. | Coefficient | Std. Err. | p-value |
|---|---|---|---|---|
| Largest Owner | eq | 1.8325 | 1.5261 | 0.230 |
| Insider Ownership | m | -0.0164 | 0.4742 | 0.972 |
| Equity Based Compensation | c | -75.947 | 113.05 | 0.502 |
| Largest Owner$^2$ | $eq^2$ | 0.2665 | 0.3194 | 0.404 |
| Insider Ownership$^2$ | $m^2$ | 0.0119 | 0.0272 | 0.662 |
| Debt to Market Capitalization | d/e | 0.1588 | 0.1699 | 0.350 |
| Capital Expenditure to Fixed Capital | cx | 0.4110 | 0.4039 | 0.309 |
| R&D Expenditure to Assets | rd | 1.2225 | 2.4982 | 0.625 |
| Intangible Capital to Fixed Capital | i/f | -0.0088 | 0.0064 | 0.167 |
| Sales to Fixed Capital | s/f | -0.0024 | 0.0700 | 0.731 |
| Operating Income to Sales | o/s | 0.0185 | 0.4105 | 0.964 |
| Number of Observations | 315 | | R2 | -1.096 |
| F(13,197) | 5.78 | | P>F | 0.000 |

[13]Estimations were done using the Stata's xtivreg2 package.

We can see that the both of the ownership variables are now insignificant, as are, in fact, all of the variables in the regression. Only the F-test is significant. The results seem to indicate that when endogeneity is controlled for there is no relationship between firm performance and ownership structure. However, we must take into account that the instruments seem weak and might be the reason why we see such large standard errors for the coefficients. In fact, the weakness of the instruments may not only cause imprecise estimates, but also as Bound, Jaeger and Baker (1993) have shown can also bias the IV-estimates, albeit to the same direction as OLS estimates (which are biased due to endogeneity). Staiger and Stock (1997) extended Bound et al. results further to show that the conventional asymptotic results fail with weak instruments. The problem is, therefore, severe.

A underidentification test can be used to test relevance of the instruments, i.e. whether they correlate highly enough with the endogenous variables to allow the proper identification of the system. For our case, the Kleibergen-Paap (2006) test, a generalization of the Anderson canonical correlation rank test, is the one we want use as it is consistent with heteroscedasticity. The idea is to test the rank of a matrix, i.e. the number of columns that are linearly independent, with the model being underindentified, when the rank is not full column rank. Performing the test we see that the statistic is highly insignificant meaning that the model is underindentified, in other words the excluded instruments do not provide enough information for us to properly identify the model.[14] This is the case even if we drop the extra beta squared from the instrument list. This places the credibility of the results and the used instruments in question. The test result is in appendix II. (Hayashi 2000)

A closely related concept to underidentification is redunancy of the instruments, which means whether including the instruments improves the (asymptotic) efficiency of the regression. The instruments are redundant, if they do not offer new information relative to the variables that are already in the model. As it turns out most of the excluded instruments were are using are indeed redundant giving futher evidence of their weakness. Appendix II has the results. (Hayashi 2000)

[14]The test was performed using Stata's xtivreg2 package.

The Sargan-Hansen test (the heteroscedasticity consistent test is the Hansen J), a test whether the instruments are uncorrelate with the residuals, is highly insinificant. This confirms at least that the instruments are exogenous relative to Q. The test results are in appendix II. (Hayashi 2000)

We can also test the endogeneity of the endogenous variables. Here we are confounded by the problem that we would need good instruments for the test to be reliable, but we already know that this is not the case. The test, calculated as the difference of two Sargen-Hansen tests, one for the model with the variables as endogenous and the other for the model with the variables as exogenous, rejects the null of exogeneity for our set of endogenous variables $(eq, eq^2, m, m^2, c)$ at 90% level offering support for the claim that they are indeed endogenous.[15] This aggravates the problem of the weak instruments, as we can be now more confident that the results in table 9 are biased. See appendix II for the test result. (Hayashi 2000)

The test results on the used instruments indicate that we should not trust the results in table 11 too much. We can conclude little, since weakness of the instruments does not only make the estimates imprecise, but might also bias the results. The results without instrumenting for the ownership and compensation variables might well be more accurate.

As part of the problem is that we have many variables to instrument, a partial remedy might be to either drop some of them or simply treat a part of them as exogenous. Since we are focused on the effects of ownership structure, treating compensation as an exogenous variable seems a small sacrifice, if it enhances the instrumenting of the ownership variables. In addition, noting that insider ownership does not seem to be sensitive to exclusion of the squared term, we can try to drop it from the equation. Now we only have to instrument the ownership share of the largest owner, its squared term and the share of insider ownership. Using the same set of instruments except changing fixed capital to assets to fixed capital to sales due to higher correlation with the ownership variables, yields the estimation results in table 12. Standard errors are again robust to heteroscedasticity.

The results show, besides a better overall fit, variables that are now statistically significant at the 95% level (R&D and leverage). What is really interesting for us is that the

[15]The test was calculated using the xtivreg2 package for Stata.

Table 12: Instrumental variable estimation results - ownership endogenous

| Variable | Abbrev. | Coefficient | Std. Err. | p-value |
|---|---|---|---|---|
| Largest Owner | eq | 1.6800 | 1.0916 | 0.123 |
| Insider Ownership | m | -0.070 | 0.1225 | 0.570 |
| Equity Based Compensation | c | -5.4718 | 9.8336 | 0.578 |
| Largest Owner$^2$ | eq$^2$ | 0.1757 | 0.2382 | 0.461 |
| Debt to Market Capitalization | d/e | 0.0716 | 0.0353 | 0.043 |
| Capital Expenditure to Fixed Capital | cx | 0.3327 | 0.2084 | 0.110 |
| R&D Expenditure to Assets | rd | 2.7706 | 1.1434 | 0.015 |
| Intangible Capital to Fixed Capital | i/f | -0.0044 | 0.0043 | 0.314 |
| Sales to Fixed Capital | s/f | -0.0010 | 0.0038 | 0.799 |
| Operating Income to Sales | o/s | 0.2042 | 0.2799 | 0.466 |
| Number of Observations | 315 | | R2 | -0.178 |
| F(12,198) | 10.11 | | P>F | 0.000 |

effect of the largest owners' ownership is now on the borderline of being significant at the 90% level suggesting that there might be a positive relationship between Q and ownership concentration even when controlling for endogeneity. However, the fact that the model residuals are highly non-normal makes the interpretation of statistical significance impossible (see appendix II).

The test for endogeneity detects endogeneity of the specified endogenous variables ($eq_{it}$, $m_{it}$, ${eq^2}_{it}$) and now at the 95% level offering more evidence that the relationship between ownership and firm performance might indeed be endogenous. However, the underidentification test is again insignificant meaning the instruments are still too weak to allow for a proper identification of the model. The results in table 12 are therefore not much more credible than those we estimated with the wider set of endogenous variables. The used instruments are too weak to allow us to infer anything about the true relationship between firm performance and ownership structure. The results themselves are in line with Himmelberg et al. (1999) and Demsetz and Villalonga (2001), who both also failed the obtain a statistically significant relationship after controlling for endogeneity, but they do not report that their instruments would be weak enough to prohibit them from drawing conclusions from their models.

# 5 Conclusions

Agency theory by Jensen and Meckling (1976) predicts that higher levels of managerial ownership should result, holding other things constant, in increased firm performance as higher ownership levels help to mitigate the inherent conflict of interest between managers and owners. They provide a clear analytical answer to the question already pondered by Berle and Means (1932). Other researchers have since provided additional insight to the topic, highlighting the possible role of large shareholders as monitors (Schleifer and Vishny 1986, Zeckhauser and Pound 1990) and also the potential problems, if the dominant owners try to exploit the firms resources at the expense of other shareholders (Barclay and Holderness 1989, Bebchuk 1999). This discussion has resulted in broadly two opposite views on the effect of ownership structure on firm performance: 1) higher levels of managerial ownership and ownership concentration mitigate agency problems and thus enhance firm performance and 2) the presence of dominant owners (insiders or outsiders) is detrimental to firm performance as it enables private benefit extraction. These two views can be combined, if we allow the relationship to be nonlinear.

This thesis has pursued an empirical line of enquiry in the spirit of Demsetz and Lehn (1985) and Himmelberg et al. (1999). The results of the previous literature have been contradictory. Demsetz and Lehn, for example, fail to find any relationship between firm performance and ownership structure. Morck et al (1988), on the other hand, do find a nonmonotonic relationship. Other researchers since Morck et al. have tried to replicate their estimations with varying success. A central point is whether ownership is treated endogenous relative to performance or not: studies that do so (e.g. Himmelberg et al. 1999, Demsetz and Villalonga 2001) have in most cases failed to find a statistically significant relationship. The exceptions include non-U.S. studies by Hu and Izumida (2008) and Kapopoulos and Lazaretou (2007). Based on the previous research, the goal of this thesis was to estimate a fixed effects model with a Finnish dataset including variables for insider and outsider ownership and equity based compensation.

The ownership data, which were collected from the annual reports of the companies, show significant ownership concentration. Both insider holdings and the level of ownership

concentration are significantly higher than in the U.S (Demsetz and Villalonga 2001) placing Finland into the category of countries, where ownership is highly concentrated. This is no surprise. A median largest owner owns more than 20 % of the company and the five largest more than 40 %. The average insider holdings are also comparatively high with the mean being 14 %, although Himmelberg et al. (1999) report a higher number for their sample of firms.

The estimated model includes the largest set of available variables controlling for firm capital structure, capital and research expenditures and market power. In addition, the firm specific effects control for time-invariant unobservable characteristics of the firms. This is important both in the light of the theoretical discussion and the empirical findings (Himmelberg et al. 1999). As common in the literature, firm performance is measured by Tobin's Q. The model is similar to those estimated in the preceding literature (e.g. Himmelberg et al. 1999), but to our knowledge is the only one to include insider ownership, ownership concentration and equity based compensation in the same equation. A broad based approach to estimating the effect of ownership structure is well justified by the theoretical discussion (Alchian 1969, Jensen and Fama 1983).

The estimation results without controlling for endogeneity are broadly in line with the predictions of the agency theory. Both insider and outsider ownership concentration have a positive and statistically significant effect on firm performance. The results do not support claim that there would be significant private benefits in owning Finnish firms, or at least the private benefits bring little adverse effects for other shareholders. When controlling the endogeneity of ownership through instrumental variables estimation, however, the results disappear. Underidentification tests reveal the instruments to be too weak to conclude anything based on them even with a limited set of instrumented variables, which makes the estimation results then highly questionable. Weak instruments do not only make the estimates imprecise, but may also bias the results (Bound, Jaeger and Baker 1993, Staiger and Stock 1997).

Because of the weakness of the used instruments, the estimation results of the thesis are inconclusive. Besides the strong theoretical case for ownership being endogenous, the endogeneity tests offer some support for the possible endogeneity, but even here we

would need good instruments to properly test whether this is indeed the case. We face the dilemma of choosing between the OLS estimates biased by endogeneity and the 2SLS estimates biased by weak instruments. Finding better instruments is, then, definitely one avenue for future research. The results are similar with Demsetz and Villalonga (2001) and Himmelberg et al. (1999), who also find no relationship between ownership and performance when controlling for endogeneity. They, however, do not report that they would have problems with the weakness of the instruments.

What lessons can we draw from the used Finnish sample compared to the other studies? There seems to be a dividing line between the U.S., with low ownership concentration, and some of the other countries with higher ownership concentration in terms of estimation results (e.g. Demsetz and Villanlonga 2001 vs. Kapopoulos and Lazaretou 2008). Ownership seems to matter more in the countries with high ownership concentration. Finland is soundly in the second category. If there are specific institutional factors influencing ownership and its effect on firm performance, we would then be inclined to think that the Finnish data would show a similar relationship between performance and ownership as Japan (Hu and Izumida 2008), Greece (Kapopoulos and Lazaretou 2007) or Germany (Mueller and Spitz 2002), for example. Indeed, the robustness of the relationship when treating ownership exogenous suggests at this direction, but we come up against the problem that we cannot put too much weight on the estimation results as they are likely to be biased due to endogeneity. The estimation results are too inconclusive to allow us to determine the relationship between ownership structure and firm performance in our sample.

# References


Agrawal, A., and Knoeber, C. (1996): "Firm performance and mechanisms to control agency problems between managers and shareholders", Journal of Financial and Quantitative Analysis 31, 377–397.

Alchian, A. (1969): "Corporate management and property rights", in Henry Manne, (Ed.), Economic Policy and Regulation of Corporate Securities. American Enterprise Institute for Public Policy Research, Washington, DC.

Alchian, A. and Demsetz, H. (1972): "Production, Information Costs, and Economic Organization", American Economic Review 62, no. 5, 777–795.

Baltagi, B. (1981): "Simultaneous equations with error components", Journal of Econometrics, vol. 17(2), 189–200.

Baltagi, B. (2008): Econometric Analysis of Panel Data, John Wiley & Sons, Chichester UK.

Barclay, M., and Holderness, C. (1989): "Private benefits from control of public corporations", Journal of Financial Economics 25, 371–395.

Berle, A. and Means, G. (1932): The Modern Corporation and Private Property, Macmillan, New York.

Bebchuk, L. (1999): "A rent-protection theory of corporate ownership and control", NBER working paper 7203, National Bureau of Economics Research, Cambridge, MA.

Bebchuk, L.; Cremers, M. and Peyer, U. (2010):"The CEO pay slice", Harvard Law School Olin Discussion Paper No. 679, September 2010. Forthcoming, Journal of Financial Economics.

Bebchuk, L. and Fried, J. (2003): "Executive Compensation as an Agency Problem", 17 Journal of Economic Perspectives, 71–92.

Bhagat, S. and Jefferis, R. (2002): The Econometrics of Corporate Governance Studies, The MIT Press, Cambridge, MA.

Bhattacharya, P. and Graham, M. (2009): "On institutional ownership and firm performance: A disaggregated view," Journal of Multinational Financial Management, vol. 19(5), 370–394.

Bodie, Z., Kane, A., Marcus, A. (2007): Investments, 7th International Edition, McGraw-Hill, New York.

Bound, J.; Jaeger, D. and Baker, R. (1993):"The Cure Can Be Worse than the Disease: A Cautionary Tale Regarding Instrumental Variables", NBER Technical Working Paper No. 137.

Burkart, Gromb and Panunzi (1997):"Large Shareholders, Monitoring, and the Value of the Firm", The Quarterly Journal of Economics 112, 693–728.

Chan, S., Martin, J. and Kensinger, J. (1990): "Corporate research and development expenditures and share value", Journal of Financial Economics, Vol. 26, Issue 2, 255–276.

Cho, M. (1998): "Ownership structure, investment and the corporate value: An empirical analysis", Journal of Financial Economics, 47, 103-21.

Cole, R. and Mehran, H. (1997): "The effect of changes in ownership structure on performance: evidence from the thrift industry", Mimeograph, Board of Governors of the Federal Reserve System.

D'Agostino, R.; Belanger, A. and D'Agostino, R. Jr. (1990):"A suggestion for using powerful and informative tests of normality. American Statistician 44, 316–321.

Demsetz, H. (1983): "The structure of ownership and the theory of the firm", Journal of Law and Economics 26, 375–390.

Demsetz, H., and Lehn, K. (1985): "The structure of corporate ownership: Causes and consequences", Journal of Political Economy 93, 1155–1177.

Demsetz, H. and Villalonga, B. (2001): "Ownership structure and corporate performance", Journal of Corporate Finance, 7, 209–233.

Easterbrook, F. and Fischel, D. (1983): "Voting in corporate law", Journal of Law and

Economics, Vol. 26, No. 2, Corporations and Private Property: A Conference Sponsored by the Hoover Institution, 395–427.

Ekholm, A. and Maury, B. (2009):"Owner Incentives and Stock Returns: Evidence from Individual Owners' Portfolio Weights" (February 15, 2009),
SSRN: http://ssrn.com/abstract=1343612.

Fama, E. (1980): "Agency Problems and the Theory of the Firm", Journal of Political Economy, 88 (April 1980): 288–307.

Fama, E. and Jensen, M. (1983): "Separation of ownership and control", Journal of Law and Economics, 301–325.

Gertler, M., Hubbard, R. (1988): "Financial factors in business fluctuations. Financial Market Volatility: Causes and Consequences." Federal Reserve Bank, Kansas City.

Greene, W. (2003): Econometric analysis, 5th Edition, Prentice Hall, Upper Saddle River, New Jersey.

Grossman, S. and Hart, O. (1980): "Takeover Bids, The Free-Rider Problem, and the Theory of the Corporation", The Bell Journal of Economics Vol. 11, No. 1 (Spring, 1980), 42–64.

Grossman, S. and Hart, O. (1982): "Corporate financial structure and managerial incentives", in McCall, J., Editor, The Economics of Information and Uncertainty, University of Chicago Press, Chicago, IL.

Grossman, S. and Hart, O. (1983): "An Analysis of the Principal-Agent Problem", Econometrica Vol. 51, No. 1 (Jan. 1983), 7–45.

Grossman, S. and Hart, O. (1988): "One share-one vote and the market for corporate control", Journal of Financial Economics Volume 20, 175–202.

Hart, O. (1983): "The Market Mechanism as an Incentive Scheme." Bell J. Econ. 14, 366-382.

Haugen, R. and Senbet, L. (1981): "Resolving the Agency Problems of External Capital through Options". The Journal of Finance, Vol. 36, No. 3 (Jun., 1981), 629–647.

Hausman, J. (1978):"Specification tests in econometrics", Econometrica 46, 1251–1271.

Hayashi, F. (2000): Econometrics, Princeton University Press, Princeton, New Jersey.

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

Holderness, C., Kroszner, R., Sheehan, D., (1999): "Were the good old days that good?: evolution of managerial stock ownership and corporate governance since the great depression", Journal of Finance 54, 435–469.

Holmström, B. (1979): "Moral Hazard and Observability", Bell J. Econ. 10 (Spring 1979): 74–91.

Holmström, B. (1992): "Contracts and the Market for Executives: Comment", in Contract Economics, edited by Lars Wein and Hans Wijkander, Blackwell Publishers.

Hu, Y. and Izumida, S. (2008): "Ownership Concentration and Corporate Performance: A Causal Analysis with Japanese Panel Data". Corporate Governance: An International Review, Vol. 16, Issue 4, 342-358.

Jarrell, G. and Poulsen, A. (1988): "Dual-class recapitalizations as antitakeover mechanisms: The recent evidence", Journal of Financial Economics, Vol. 20, 129–152.

Jensen, M. (1986): "Agency costs of free cash flow, corporate finance, and takeovers", American Economic Review 76, 323–329.

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

Kleibergen, F. and Paap, R. (2006):"Generalized Reduced Rank Tests Using the Singular Value Decomposition", Journal of Econometrics, Vol. 133, 97–126.

Kapopoulos, P. and Lazaretou, S. (2007): Corporate Ownership Structure and Firm Performance: evidence from Greek firms", Corporate Governance: An International Review, Vol. 15, Issue 2, 144-158.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R. (2002): "Investor protec-

tion and corporate valuation", Journal of Finance 57, 1147-1170.

Loderer, C. and Martin, K. (1997): "Executive stock ownership and performance tracking faint traces", Journal of Financial Economics, Volume 45, Issue 2, August 1997, 223–255.

Manne, H. (1965): "Mergers and the market for corporate control", Journal of Political Economy 73, 110–120.

Maury, B. and Pajuste, A. (2005):"Multiple large shareholders and firm value", Journal of Banking and Finance, 29, 1813–1834.

McConnell, J. and Servaes, H. (1990): "Additional evidence on equity ownership and corporate value", Journal of Financial Economics 27, 595–612.

Mirrlees, J. (1974), "Notes on welfare economics, information and uncertainty", in: M. Balch, D. McFadden and S. Wu, eds.: Essays on economic behavior under uncertainty, North Holland, Amsterdam.

Mirrlees, J. (1976), "The optimal structure of incentives and authority within an organization", Bell Journal of Economics 7: 105–131.

Morck, R.; Shleifer, A. and Vishny, R. (1988): "Management ownership and market valuation: an empirical analysis", Journal of Financial economics 20, 293–316.

Mueller, E. and Spitz, A. (2002):"Managerial ownership and firm performance in German small and medium-sized enterprises", CEPDP, 528, Centre for Economic Performance, London School of Economics and Political Science.

Murphy, K. (1999): "Executive Compensation"', in Orley Ashenfelter and David Card, eds., Handbook of Labor Economics, Vol. 3. Amsterdam, North-Holland.

Nenova, T. (2001): "How to dominate a firm with valuable control: Regulation, security-voting structure, and ownership patterns of dual-class firms", Unpublished working paper, Harvard University, Cambridge, MA.

Nenova, T. (2003): "The value of corporate voting rights and control: A cross-country analysis", Journal of Financial Economics 68, 325–351.

Neyman, J., Scott, E. (1948): "Consistent estimation from partially consistent observa-

tions", Econometrica 16, 1–32.

Pagano and Röell (1998): "The Choice of Stock Ownership Structure: Agency Costs, Monitoring and the Decision to Go Public", The Quarterly Journal of Economics 113, 187–188.

Pajarinen, M. and Ylä-Anttila, P. (2006):"Omistajuus ja yritysten menestyminen: analyysia suomalaisella aineistolla" (Ownership and firm performance: some evidence from Finland), The Research Institute of the Finnish Economy, Discussion Papers, No. 1007.

Pesaran, H. (2004):"General dignostic tests for cross section dependence in panels", Cambridge Working Paper in Economics 0641.

Shleifer, A., and Vishny, R. (1986): "Large shareholders and corporate control", Journal of Political Economy 95, 461–488.

Shleifer, A. and Wolfenzon (2002): "Investor protection andequity markets", Journal of Financial Economics 66, 3-28.

Smith, A. (1776): The Wealth of Nations, reprinted in 1991, New York, Albert A. Knopf - Random House, Everyman's Library.

Staiger, D. and Stock, J. (1997): "Instrumental Variables Regression with Weak Instruments", Econometrica, Vol. 65, No. 3, 557–586.

Stulz, R. (1988): "Managerial control of voting rights: Financing policies and the market for corporate control", Journal of Financial Economics 20, 25–54.

Thompson, S. (2009):"Simple Formulas for Standard Errors that Cluster by Both Firm and Time", http://ssrn.com/abstract=914002.

Tobin, J. (1969): "A general equilibrium approach to monetary theory". Journal of Money Credit and Banking 1, 15–29.

Verbeek, M. (2008): A Guide to Modern Econometrics, 3rd edition, John Wiley & Sons, Chichester UK.

White, H. (1980): "A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity.", Econometrica 48, 817–830.

Wooldridge, J. (2002): Econometric Analysis of Cross Section and Panel Data, the MIT Press, Cambridge, Massachusetts.

Zeckhauser, R., Pound, J. (1990): "Are large shareholders effective monitors?: an investigation of share ownership and corporate performance", in: Hubbard, G. (Ed.), Asymmetric Information, Corporate Finance, and Investment. University of Chicago Press, Chicago.

Stata packages:

Baum, C., Schaffer and M. and Stillman, S. (2010):"ivreg2: Stata module for extended instrumental variables/2SLS, GMM and AC/HAC, LIML and k-class regression",
http://ideas.repec.org/c/boc/bocode/s425401.html

De Hoyos, R. and Sarafidis, V. (2006):"XTCSD: Stata module to test for cross-sectional dependence in panel data models", Statistical Software Components S456736, Boston College Department of Economics, revised 10 Apr 2007,
http://ideas.repec.org/c/boc/bocode/s456736.html

Drukker, D. (2003):"xtserial: Testing for serial correlation in linear panel-data models", The Stata Journal (3)2, 1-10.

Schaffer, M. (2010):"xtivreg2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models".
http://ideas.repec.org/c/boc/bocode/s456501.html

# Appendix I

Fixed effects estimation test results

Residual tests for model (13)

| | |
|---|---|
| Pesaran's test of cross-sectional independence (Stata xtcsd package) | |
| H0: No cross-sectional dependence | |
| Test value | 3.107 |
| Probability | 0.0019 |
| Average absolute value of the off-diagonal elements | 0.668 |
| | |
| Woolridge test for autocorrelation in panel data (Stata xtserial package) | |
| H0: no first order autocorrelation | |
| F(1,104) = | 4.579 |
| Probability > F | 0.0347 |
| | |
| Modified Wald test for groupwise heteroscedasticity (Stata xttest3 package) | |
| H0: sigma(i)^2 = sigma^2 for all *i* | |
| chi2 (105) = | 250000 |
| Probability > chi2 = | 0.0000 |

D'Agostino test for nonnormality of the residuals (Stata sktest

| Obs | Pr(Skewness) | Pr(Kurtosis) | Adj. chi2(2) | Probability > chi2 |
|---|---|---|---|---|
| 315 | 0.0166 | 0.0000 | 22.49 | 0.0000 |

**Hausman specification test: fixed vs. random effects for (14)**

Test: Ho: difference in coefficients not systematic

| | |
|---|---|
| chi2(12) = | 70.02 |
| Prob>chi2 = | 0 |
| | |
| Correlation between $\mu_i$ and $x_{it}$ = | -0.6178 |

**Residual tests for model (14)**

| | |
|---|---|
| Pesaran's test of cross-sectional independence (Stata xtcsd package) | |
| H0: No cross-sectional dependence | |
| Test value | -0.891 |
| Probability | 0.3728 |
| Average absolute value of the off-diagonal elements | 0.632 |
| | |
| Woolridge test for autocorrelation in panel data (Stata xtserial package) | |
| H0: no first order autocorrelation | |
| F(1,104) = | 0.964 |
| Probability > F | 0.3285 |
| | |
| Modified Wald test for groupwise heteroscedasticity (Stata xttest3 package) | |
| H0: sigma(i)^2 = sigma^2 for all *i* | |
| chi2 (105) = | 59470.37 |
| Probability > chi2 = | 0.0000 |

D'Agostino test for nonnormality of the residuals (Stata sktest)

| Obs | Pr(Skewness) | Pr(Kurtosis) | Adj. chi2(2) | Probability > chi2 |
|---|---|---|---|---|
| 315 | 0.4691 | 0.0289 | 5.32 | 0.07 |

**Hausman specification test: fixed vs. random effects for (14)**

| | |
|---|---|
| Test: Ho: difference in coefficients not systematic | |
| chi2(13) = | 42.22 |
| Prob>chi2 = | 0.0001 |
| | |
| Correlation between $\mu_i$ and $x_{it}$ = | -0.5408 |

**The fixed effects model (14) without the quadratic terms for ownership variables**

| Variable | Abbrev. | Coefficient | Std. Err. | p-value |
|---|---|---|---|---|
| Largest Owner | eq | 0.0148 | 0.0807 | 0.855 |
| Insider Ownership | m | 0.0304 | 0.0124 | 0.015 |
| Equity Based Compensation | c | -7.3525 | 4.7831 | 0.124 |
| Total Assets | a | 0.0000 | 0.0000 | 0.332 |
| Debt to Market Capitalization | d/e | 0.0347 | 0.0259 | 0.181 |
| Capital Expenditure to Fixed Capital | cx | 0.1246 | 0.0885 | 0.159 |
| R&D Expenditure to Assets | rd | 1.6787 | 0.3232 | 0.000 |
| Intangible Capital to Fixed Capital | i/f | -0.0060 | 0.0019 | 0.001 |
| Sales to Fixed Capital | s/f | 0.0047 | 0.0015 | 0.002 |
| Operating Income to Sales | o/s | 0.0453 | 0.0809 | 0.575 |
| | | | | |
| Number of Observations | 315 | | R2 | 0.632 |
| F(14,196) | 47.3 | | P>F | 0.000 |

# Appendix II

Instrumental variables estimation test results

Instrument tests with ownership and compensation variables (eq, $eq^2$, m, $m^2$ and c) endogenous

| | |
|---|---|
| The Kleibergen-Paap test for underidentification with the whole set of instruments | |
| H0: matrix not full column rank (model underidentified) | |
| LM statistic | 0.903 |
| Chi2(2) p-value | 0.6366 |

| | |
|---|---|
| The Kleibergen-Paap test for underidentification with $beta^2$ dropped from the instrument list | |
| H0: matrix not full column rank (model underidentified) | |
| LM statistic | 0.050 |
| Chi-sq(2) p-value | 0.8223 |

| | |
|---|---|
| Hansen's J test for identifiying restrictions | |
| H0: Instruments uncorrelated with the residual term | |
| Hansen J statistic | 0.002 |
| Chi2(1) p-value | 0.9612 |

Redunancy tests for instruments
H0: Instrument redundant

| | Test value | Chi2(5) p-value |
|---|---|---|
| Beta | 7.108 | 0.2128 |
| $Beta^2$ | 9.633 | 0.0863 |
| Sebeta | 3.651 | 0.6007 |
| Sigma | 5.547 | 0.3528 |
| Fixed capital to assets | 10.862 | 0.0542 |
| Ln(sales) | 3.73 | 0.5889 |

Endogeneity test for eq, $eq^2$, m, $m^2$ and c
H0: variables exogenous

| | |
|---|---|
| Test value | 9.991 |
| Chi2(3) p-value | 0.0755 |

Instrument tests with only ownership variables (eq, $eq^2$, m) endogenous

The Kleibergen-Paap test for underidentification
H0: matrix not full column rank (model underidentified)

| | |
|---|---|
| LM statistic | 1.986 |
| Chi2(2) p-value | 0.3704 |

Hansen's J test for identifiying restrictions
H0: Instruments uncorrelated with the residual term

| | |
|---|---|
| Hansen J statistic | 0.136 |
| Chi2(1) p-value | 0.712 |

Endogeneity test for eq, $eq^2$, and m
H0: variables exogenous

| | |
|---|---|
| Test value | 8.464 |
| Chi2(3) p-value | 0.0373 |

D'Agostino test for nonnormality of the residuals (Stata sktest)

| Obs | Pr(Skewness) | Pr(Kurtosis) | Adj. chi2(2) | Probability > chi2 |
|---|---|---|---|---|
| 315 | 0.2820 | 0.0000 | 27.24 | 0.0000 |

# Appendix III

The collected ownership and compensation (in millions of euros) data, averages over the years 2007-2009

| Firm | Largest owner ownership | Largest owner voting share | Five largest ownership | Five largest voting share | Insider ownership | Insiders' voting share | Incurred expenses |
|---|---|---|---|---|---|---|---|
| Affecto | 6.9 | 6.9 | 26.9 | 26.9 | 7.3 | 7.3 | 0.31 |
| Ahlström | 10.0 | 10.0 | 22.5 | 22.5 | 1.0 | 1.0 | 0.27 |
| Aldata Solutions | 9.6 | 9.6 | 18.8 | 18.8 | 0.3 | 0.3 | 0.45 |
| Alma Media | 17.4 | 17.4 | 55.3 | 55.3 | 0.9 | 0.9 | 0.70 |
| Amer Sports | 11.0 | 11.0 | 23.9 | 23.9 | 2.4 | 2.4 | 0.83 |
| Aspo | 10.8 | 10.8 | 27.7 | 27.7 | 9.8 | 9.8 | 0.29 |
| Aspocomp Group | 4.5 | 4.5 | 17.0 | 17.0 | 1.1 | 1.1 | 0.00 |
| Atria | 26.1 | 46.4 | 64.2 | 90.7 | 0.1 | 0.0 | 0.19 |
| Basware | 9.3 | 9.3 | 40.5 | 40.5 | 33.2 | 33.2 | 0.32 |
| Biohit | 28.3 | 62.7 | 50.3 | 86.8 | 39.1 | 65.6 | 0.00 |
| Biotie Therapies | 21.9 | 21.9 | 44.5 | 44.5 | 5.5 | 5.5 | 0.31 |
| Cargotec | 11.7 | 23.0 | 41.8 | 76.0 | 12.3 | 23.1 | 0.57 |
| Cencorp | 33.4 | 33.4 | 62.6 | 62.6 | 38.6 | 38.6 | 0.00 |
| Componenta | 35.6 | 35.6 | 75.9 | 75.9 | 37.4 | 37.4 | 0.03 |
| Comptel | 18.3 | 18.3 | 47.1 | 47.1 | 0.3 | 0.3 | 0.98 |
| Cramo | 13.3 | 13.3 | 28.0 | 28.0 | 0.7 | 0.7 | 2.28 |
| Digia | 17.5 | 17.5 | 45.4 | 45.4 | 25.7 | 25.7 | 0.36 |
| Efore | 11.6 | 11.6 | 27.3 | 27.3 | 11.8 | 11.8 | 0.18 |
| Elcoteq | 21.5 | 43.6 | 43.9 | 85.6 | 41.2 | 85.0 | 0.48 |
| Elecster | 35.5 | 45.7 | 70.1 | 91.9 | 1.7 | 2.0 | 0.00 |
| Elektrobit | 21.3 | 21.3 | 49.2 | 49.2 | 35.4 | 35.4 | 0.86 |
| Elisa | 11.0 | 11.0 | 22.0 | 22.0 | 0.0 | 0.0 | 5.00 |
| Etteplan | 20.2 | 20.2 | 53.0 | 53.0 | 27.5 | 27.5 | 0.10 |
| Exel Composites | 29.4 | 29.4 | 46.1 | 46.1 | 1.8 | 1.8 | 0.17 |
| Finnair | 55.8 | 55.8 | 72.0 | 72.0 | 0.1 | 0.1 | 0.00 |
| Finnlines | 61.1 | 61.1 | 75.7 | 75.7 | 0.8 | 0.8 | 0.00 |
| Fiskars | 13.5 | 17.1 | 41.9 | 48.7 | 27.5 | 35.6 | 0.00 |
| Fortum | 50.8 | 50.8 | 54.7 | 54.7 | 0.0 | 0.0 | 10.67 |
| F-Secure | 40.4 | 40.4 | 57.0 | 57.0 | 42.0 | 42.0 | 0.99 |
| Geosentric | 28.7 | 28.7 | 54.8 | 54.8 | 38.0 | 38.0 | 1.17 |
| Glaston | 16.9 | 16.9 | 42.8 | 42.8 | 2.8 | 2.8 | 0.40 |
| HKScan | 35.3 | 72.0 | 53.4 | 86.0 | 0.3 | 0.1 | 0.80 |
| Honkarakenne | 31.3 | 65.1 | 49.4 | 76.4 | 4.4 | 5.9 | 0.00 |
| Huhtamäki | 15.3 | 15.3 | 26.1 | 26.1 | 0.3 | 0.3 | 2.00 |
| Ilkka Yhtymä | 5.0 | 4.1 | 16.2 | 15.8 | 4.8 | 7.8 | 0.00 |
| Incap | 29.0 | 29.0 | 63.4 | 63.4 | 16.9 | 16.9 | 0.04 |
| Ixonos | 12.8 | 12.8 | 31.2 | 31.2 | 1.2 | 1.2 | 0.11 |
| Kemira | 16.9 | 16.9 | 51.9 | 51.9 | 0.7 | 0.7 | 3.07 |
| Keskisuomalainen | 4.8 | 4.3 | 14.7 | 14.7 | 4.1 | 4.3 | 0.00 |
| Kesko | 4.2 | 9.1 | 12.8 | 30.1 | 0.4 | 0.6 | 3.77 |
| Kesla | 16.0 | 52.7 | 43.5 | 90.7 | 12.1 | 35.4 | 0.00 |
| Kone | 20.5 | 61.7 | 35.1 | 69.3 | 21.0 | 62.0 | 15.03 |
| Konecranes | 4.3 | 4.3 | 13.0 | 13.0 | 4.6 | 4.6 | 2.50 |
| Lännen Tehtaat | 7.1 | 7.1 | 28.4 | 28.4 | 0.4 | 0.4 | 0.00 |
| Lassila & Tikanoja | 8.6 | 8.6 | 30.0 | 30.0 | 11.8 | 11.8 | 0.98 |
| Lemminkäinen | 21.9 | 21.9 | 64.5 | 64.5 | 10.1 | 10.1 | 0.00 |
| Marimekko | 13.0 | 13.0 | 38.4 | 38.4 | 12.4 | 12.4 | 0.00 |
| Martela | 12.6 | 38.8 | 37.5 | 72.5 | 8.6 | 17.2 | 0.43 |
| Metso | 10.9 | 10.9 | 18.5 | 18.5 | 0.0 | 0.0 | 2.33 |
| M-Real | 38.6 | 60.5 | 46.1 | 76.8 | 0.2 | 0.1 | 0.03 |
| Neste Oil | 50.1 | 50.1 | 56.0 | 56.0 | 0.0 | 0.0 | 3.00 |
| Nokia | 0.5 | 0.5 | 1.7 | 1.7 | 0.1 | 0.1 | 105.33 |
| Nokian Renkaat | 16.1 | 16.1 | 28.9 | 28.9 | 0.0 | 0.0 | 14.57 |
| Nordic Aluminium | 63.8 | 63.8 | 80.5 | 80.5 | 66.6 | 66.6 | 0.00 |

| Firm | Largest owner ownership | Largest owner voting share | Five largest ownership | Five largest voting share | Insider ownership | Insiders' voting share | Incurred expenses |
|---|---|---|---|---|---|---|---|
| Okmetic | 16.0 | 16.0 | 37.3 | 37.3 | 0.1 | 0.1 | 0.00 |
| Olvi | 15.2 | 52.4 | 27.1 | 82.5 | 5.3 | 6.8 | 0.00 |
| Oral Hammaslääkärit | 29.3 | 29.3 | 64.5 | 64.5 | 31.2 | 31.2 | 0.06 |
| Oriola-KD | 2.7 | 4.9 | 8.9 | 18.3 | 0.1 | 0.1 | 1.07 |
| Orion | 5.2 | 4.3 | 12.4 | 18.2 | 1.1 | 2.3 | 1.67 |
| Outokumpu | 31.1 | 31.1 | 45.1 | 45.1 | 0.0 | 0.0 | 2.33 |
| Outotec | 4.6 | 4.6 | 10.8 | 10.8 | 0.1 | 0.1 | 0.17 |
| Panostaja | 12.9 | 16.7 | 37.4 | 45.4 | 16.9 | 18.3 | 0.09 |
| PKC Group | 8.7 | 8.7 | 24.7 | 24.7 | 2.8 | 2.8 | 0.28 |
| Pohjois-Karjalan kp. | 25.1 | 25.1 | 79.6 | 79.6 | 47.4 | 47.4 | 0.00 |
| Ponsse | 47.6 | 47.6 | 65.5 | 65.5 | 58.1 | 58.1 | 0.01 |
| Pöyry | 31.2 | 31.2 | 49.1 | 49.1 | 0.3 | 0.3 | 1.66 |
| Proha | 17.3 | 17.3 | 35.6 | 35.6 | 7.0 | 7.0 | 0.09 |
| QPR Software | 12.9 | 12.9 | 54.7 | 54.7 | 16.5 | 16.5 | 0.00 |
| Raisio | 2.5 | 9.1 | 8.4 | 14.5 | 2.8 | 3.8 | 1.17 |
| Ramirent | 26.0 | 26.0 | 49.9 | 49.9 | 11.0 | 11.0 | 0.42 |
| Rapala | 27.4 | 27.4 | 58.6 | 58.6 | 6.0 | 6.0 | 0.27 |
| Rautaruukki | 39.7 | 39.7 | 45.8 | 45.8 | 0.1 | 0.1 | 3.33 |
| Raute | 13.1 | 5.6 | 26.0 | 24.9 | 4.8 | 9.1 | 0.09 |
| Revenio Group | 19.7 | 19.7 | 48.8 | 48.8 | 27.9 | 27.9 | 0.03 |
| Ruukki Group | 22.8 | 22.8 | 57.2 | 57.2 | 40.4 | 40.4 | 0.65 |
| Salcomp | 69.7 | 69.7 | 86.1 | 86.1 | 1.5 | 1.5 | 0.39 |
| Sanoma | 23.0 | 23.0 | 49.5 | 49.5 | 7.6 | 7.6 | 4.77 |
| Scanfil | 33.2 | 33.2 | 62.9 | 62.9 | 44.7 | 44.7 | 0.03 |
| Solteq | 27.9 | 27.9 | 59.3 | 59.3 | 41.9 | 41.9 | 0.00 |
| Stockmann | 10.8 | 16.7 | 36.4 | 56.1 | 10.3 | 15.5 | 1.43 |
| Stonesoft | 18.2 | 18.2 | 42.9 | 42.9 | 36.7 | 36.7 | 0.07 |
| Stora Enso | 12.3 | 26.8 | 28.8 | 70.5 | 0.0 | 0.0 | -2.10 |
| Suominen | 12.1 | 12.1 | 40.0 | 40.0 | 21.7 | 21.7 | 0.05 |
| Talentum | 30.6 | 30.6 | 54.4 | 54.4 | 6.9 | 6.9 | 0.13 |
| Tecnotree | 5.3 | 5.3 | 17.0 | 17.0 | 4.4 | 4.4 | 0.13 |
| Tectia | 50.6 | 50.6 | 73.9 | 73.9 | 62.7 | 62.7 | 0.00 |
| Teleste | 13.0 | 13.0 | 31.4 | 31.4 | 0.7 | 0.7 | 0.18 |
| TeliaSonera | 37.3 | 37.3 | 57.5 | 57.5 | 0.0 | 0.0 | 0.00 |
| Tieto | 7.1 | 7.1 | 21.5 | 21.5 | 0.1 | 0.1 | 4.00 |
| Tiimari | 21.0 | 21.0 | 45.4 | 45.4 | 22.1 | 22.1 | 0.46 |
| Trainers House | 32.7 | 32.7 | 50.6 | 50.6 | 36.4 | 36.4 | 0.11 |
| Tulikivi | 11.2 | 24.3 | 38.9 | 74.1 | 20.3 | 53.1 | 0.01 |
| Turkistuottajat | 30.0 | 61.7 | 56.2 | 83.6 | 0.1 | 0.0 | 0.00 |
| Turvatiimi | 53.8 | 53.8 | 70.4 | 70.4 | 45.6 | 45.6 | 0.06 |
| UPM-Kymmene | 8.5 | 8.5 | 17.6 | 17.6 | 0.2 | 0.2 | 9.33 |
| Uponor | 23.5 | 23.5 | 38.6 | 38.6 | 1.1 | 1.1 | 0.07 |
| Vaahto Group | 17.8 | 21.9 | 76.7 | 81.0 | 35.2 | 35.6 | 0.00 |
| Vacon | 16.7 | 16.7 | 28.4 | 28.4 | 6.7 | 6.7 | 0.93 |
| Vaisala | 10.1 | 21.7 | 32.7 | 55.0 | 7.5 | 15.9 | 0.00 |
| Wärtsilä | 16.6 | 21.3 | 26.1 | 35.2 | 0.1 | 0.2 | 2.67 |
| Westend ICT | 24.4 | 24.4 | 56.2 | 56.2 | 0.0 | 0.0 | 0.00 |
| Viking Line | 15.1 | 15.1 | 44.1 | 44.1 | 8.0 | 8.0 | 0.00 |
| Wulff Group | 38.9 | 38.9 | 80.4 | 80.4 | 61.9 | 61.9 | 0.02 |
| YIT | 9.0 | 9.0 | 22.8 | 22.8 | 4.5 | 4.5 | 2.38 |
| Yleiselektroniikka | 50.1 | 78.1 | 70.4 | 90.7 | 53.4 | 70.9 | 0.00 |