Shareholder Diversification and the Value of Control

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Key words: Shareholder Diversification, Capital Structure, Value of Control

JEL Classification: G32

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1. Introduction

La Porta, Lopez-de-Silanes, and Shleifer (1999) find that corporate ownership is quite concentrated in a number of countries. Further, insiders are often observed to hold large controlling blocks. Direct estimates of shareholder wealth, used in this study, reflect a similar tendency with Swedish controlling shareholders investing, on average, more than one-third of their wealth in one firm. Zingales (1994) argues that there is little reason to hold large controlling blocks of shares in a company, unless there are private benefits of control. The high level of ownership concentration in Sweden and the rest of Europe is therefore by itself an indication of the value of corporate control.

This paper approximates the value of corporate control in a novel way. We model and estimate the value of an investment portfolio to a control-oriented, poorly diversified risk-averse shareholder in the firm. It is assumed that the shareholder’s portfolio consists of some combination of risk free assets and company shares and that the company issues both debt and shares. The Lambert, Larcker and Verrecchia (1991) executive compensation model is extended to include the impact of debt and consequently applied to value shares in the firm. While this model provides an estimate of the value of a share to a poorly diversified risk-averse shareholder, the Black and Scholes’ (1973) option pricing model provides an estimate of the market value of the share (Galai and Masulis, 1976 and Jensen and Meckling, 1976). The difference between the value to the shareholder and the value in the market gives an estimate of the cost of poor diversification to the shareholder. Essentially, in a competitive market marginal benefits to the shareholder of holding a controlling interest in the firm (voting control) should
equal marginal costs to the shareholder of maintaining control. The costs stem from increased risk in the form of poor diversification; see Stultz (1988). Thus we argue that the difference between the Lambert, Larcker and Verrecchia value and the Black Scholes value provides a measure of the cost of attaining control of the firm and this is an estimate of the value of corporate control and provides at least a lower bound on the magnitude of the private benefits of control.

Our approach is applicable to any country. We test its implications in a Swedish setting where direct estimates of executives’ wealth are available and control considerations appear to be important; see Agnblad et al (2001). Additionally, Nenova (2000) makes a cross-country analysis of the value that the controlling shareholder expropriates from a company to the detriment of minority shareholders. These control benefits are measured by the price difference between voting and non- (low-) voting stock. She reports that in Sweden this value, i.e. the pecuniary benefits of control, is only 1%. Thus, if there were no other private benefits of control there would be no reason to hold a large controlling block in a Swedish company (Zingales (1994)). But La Porta et al (1999) report that a family has a large controlling block of shares (>20%) in 45% (60%) of the large (medium sized) publicly traded Swedish corporations. This is consistent with large non-pecuniary benefits of control, especially for families. The non-pecuniary benefits of control come from the power of being in control, e.g. the private value of making pivotal decisions about how to allocate financial and non-financial resources and people within a firm. This value of control is person specific and rests with ownership and it is not easily transferable to outsiders and to management. Therefore, the control rights should be more
valuable to individual owners (an individual, a group of individuals or a family in control) than for institutional owners (financial institutions, other public companies, foundations, associations, or state or community in control) (see Högfeldt and Holmen (2001)). We therefore distinguish between individually controlled firms and institutionally controlled.

Several authors have attempted to estimate the value of corporate control and the magnitude of private benefits enjoyed by controlling shareholders. The most widely used approach has been to estimate the price differential between voting and non- (low-) voting shares (see for example McConnell and Mikkelson (1983), Zingales (1994), Rydqvist (1987), Chung and Kim (1999), and Nenova (2000)). This approach has several limitations. First, it requires that the firm actually has dual class shares and that both types of shares are listed.¹ This results in selection bias. Secondly, as pointed out by Zingales (1994), the voting premium is affected by the probability that the control of a company is expected to change hands. If the probability is very low, the voting premium goes to zero. The voting premium is therefore only a good estimate of the value of control at a tender offer, a transfer of the controlling block or a control contest (Rydqvist (1996)). Our approach does not suffer from these limitations and the value of control can be estimated without a transfer of control, i.e. we can estimate the value of control for firms where a majority shareholder dwarfs any possible competitor of control by keeping all the A-shares. Since the magnitude of the private benefit of control is most substantial for

¹ On the Stockholm Stock Exchange 2/3 of the companies have dual class shares (Facchio and Lang (2002)). Firms typically issue two types of shares (A and B) with equal cash flow rights but different voting rights. Typically, A shares carry 10 votes per share while B shares carry one vote per share. Furthermore, it is not unusual for only the B shares to be traded while the majority owner keeps all A-shares at the IPO.
these shareholders, this is an important advantage. Third, the voting premium only captures the pecuniary benefits of control while our approach captures an estimate of the total value the controlling owner puts on being in control. Finally, in Sweden the voting stock are generally very illiquid. This probably results in a discount on the voting stock, which is difficult to disentangle from the voting premium. In fact, due to superior liquidity the low voting stock sometimes trades at a premium compared to the voting stock.

As far as we are aware, this is the first paper, which applies the Lambert, Larcker, and Verrecchia (1991) model using real data. We use a Swedish sample with 232 firm observations, which includes direct estimates of the controlling owners’ wealth, firm capital structure and several other firm characteristic variables. One shortcoming of our approach is that we assume the constant relative risk aversion (CRRA) power utility function describes investor behaviour. Further, given the difficulty of identifying the level of risk aversion for each investor we assume investors are homogeneous and apply the same level of risk aversion to all of investors in the sample. We therefore work with three different parameters (1, 2, and 3) throughout the paper.\(^2\) While our estimates suggest no value of control to institutional owners, we find that for CRRA parameters 2 and 3 the value of control is substantial for individual owners in general, and for the founder in particular. At a CRRA parameter of 2 (3), the average control premium for founders is 12% (25%). The value of control increases with the size of the controlling block but decreases with firm size and firm performance.

\(^2\) Lambert, Larcker, and Verrecchia (1991) use the parameters 0.5, 2, 3, and 4. Hall and Murphy (2000b) use the parameters 2 and 3.
The paper is organized as follows. The next section outlines our model. In section 3 we describe the data and present the some descriptive simulation results. We analyse the general level of the value of control in section 4. In this section we also analyse different subsamples and present results from cross-sectional regressions on the estimated control premiums. Section 5 concludes and summarizes.

2. Model

In this section we present the model we use to approximate the value of control. Shareholder wealth is assumed split between shares and risk free assets. It is assumed that if a risk averse shareholder is not optimally diversified when holding a controlling interest in the firm, then the cost of poor diversification equals the benefits of holding a controlling interest in the firm. Although we are able to approximate the cost of control for the owner assuming that the owner equates costs with benefits of control, it is possible that the perceived benefits may actually exceed the cost of gaining control. There seems to be no simple way that we are aware of to identify the actual benefit of control to the manager other than via our indirect method. In such cases our estimate provides a lower limit for the benefits of control.  

Most firms issue debt of various types and for the purpose of this paper we assume that the debt has duration equal to 10 years. To simplify the modelling of debt we assume that we may approximate the firm’s debt with a zero coupon bond whose maturity and

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3 We are indebted to Professor F. Douglas Foster for raising this issue.
face value equals the firm’s debt duration and face value. With this simplification it is possible to value the shares in the firm as an option written on the assets of the firm with exercise price equal to the face value of the zero coupon debt (Galai and Masulis, 1976 and Jensen and Meckling, 1976).

Thus, we assume risk aversion on the part of the shareholder who chooses to hold a controlling interest in the company and we also assume that the firm issues debt as well as shares. Debt is assumed to have a duration of 10 years and is approximated with a zero-coupon bond maturing in 10 years. Given these assumptions, the value of the shares held in the firm can be estimated using a modified version of the Lambert, Larcker and Verrecchia (1991) model. However, as indicated in Hall and Murphy (2000a and 2000b), the Black Scholes (1973) pricing model also provides an estimate of the opportunity cost to the shareholder, or market value, of holding shares in the firm instead of being optimally diversified. The control premium, or cost of control, is defined as being equal to the cost of poor diversification which is calculated as the market value of the shares (the Black Scholes value) less the value of the shares in the hands of the shareholder (the Lambert, Larcker and Verrecchia value).

Consistent with Lambert, Larcker and Verrecchia (1991), the poorly diversified risk-averse shareholder is assumed to maximise expected utility using a constant relative risk aversion utility function.

Lambert, Larcker and Verrecchia (1991) and Hall and Murphy (2000b) use options with 10-years to maturity.
\[ U(w) = \begin{cases} \frac{1}{(1 - \alpha)w^{1-\alpha}}, & \text{if } \alpha \neq 1 \\ \log(w), & \text{if } \alpha = 1 \end{cases} \]  

(1)

where \( U(w) \) = utility function, \((U' > 0 \text{ and } U'' < 0)\)
\( \log(w) \) = natural log of \( w \)
\( \alpha \) = constant relative risk aversion parameter
\( w \) = wealth

The shareholder is assumed to hold a combination of risk free assets and shares and the shares are valued in the hands of the shareholder using the discounted certainty equivalent value of the portfolio. The initial portfolio investment is written as:

\[ (W + N_s S) \]  

(2)

Where \( W \) = wealth invested at the risk free rate
\( N_s \) = number of shares acquired
\( S \) = present value of the shares in the hands of the shareholder

It should be remembered that the shareholder could choose to lever up their investment such that the shareholder borrows at the risk free rate. In this case it is assumed that the investor’s wealth will always be greater than or equal to zero regardless of the state of the world, consistent with present bankruptcy laws. The firm is assumed liquidated at the maturity date of the zero coupon debt, consistent with Galai and Masulis (1976), Jensen and Meckling (1976) and the shares are valued as call options on the assets of the firm with an exercise price equal to the face value of the zero coupon debt. The shareholder value attached to the \( N_s \) shares in the investment portfolio is determined by solving for \( S \) where the value of the shares held in the firm is defined within the equality:

\[
\mathbb{E} \left[ U \left( W(1 + R)^T + N_s S^* \right) f(P) \right] dP
= \mathbb{E} \left[ U \left( (W + N_s S)(1 + R)^T \right) f(P) \right] dP
\]

(3)
where $P$ = underlying asset value per share, with asset returns log normally distributed with mean $\left( R + B_A RP - 0.5\sigma^2 \right) T$ and variance $\sigma^2 T$

$R$ = risk free rate of return  
$B_A$ = the underlying asset beta  
$RP$ = market risk premium  
$\sigma^2$ = underlying asset return volatility  
$T$ = time to liquidation of the firm  
$S^*$ = value of share in a firm at time $T$ given debt per share $D$

or $\max(P - D, 0)$

The value that a poorly diversified risk averse shareholder places on shares is a function of shareholder risk aversion, the proportion of wealth invested in shares, firm leverage, the current value of the assets of the firm, the expected return and volatility of the underlying asset returns, the level of interest rates and the time to liquidation of the firm and its securities.

3. Data Sources and Descriptive Statistics

To test the model on real data we collect ownership data for all firms listed on the Stockholm Stock Exchange (A-list, OTC, or unofficial list) for the years 1988 and 1991. It includes, with few exceptions, the largest corporations in Sweden. The shareholder data is obtained from Sundqvist (1988 and 1991), who reports the major shareholders for all listed firms. Balance sheet and income statement data is provided by FINDATA.

3.1 Ownership and Wealth

We hypothesize that families and individuals value control differently than institutions and we therefore distinguish between individually controlled firms and institutionally

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5 We limit our study to these two years since these were the two last occasions our source (Affärsvärlden) for estimates of the largest shareholders’ wealth was published. It is also before the Swedish financial crisis.
controlled firms. A firm is classified as individually controlled when there is a traceable individual, or group of individuals, who ultimately controls the largest voting block of shares in the corporation. All other categories of largest shareholder are classified as institutional owners. The institutional owners group includes financial institutions, public corporations, foundations, state or community governments, or associations such as unions. Table 1 divides the sample according to ownership categories. The sample is fairly evenly split between individually controlled (48.5%) and institutionally controlled firms (51.5%). For the individually controlled firms about half are controlled by the founder or his family (57 out of 113).

For individuals we collect wealth data from Affärsvärlden (1988, 1991). Affärsvärlden reports the richest Swedish individuals and families with a net wealth of SEK 100 million (approximately USD 15 million) or more. Therefore, firms whose largest shareholder is an individual with wealth of less than 100 million SEK are excluded from our sample. In order to approximate the net wealth of an individual, Affärsvärlden has carried out interviews and exploited various official data sources such as: annual reports, real estate registers, tax authority records and various commercial data bases. Annual reports were used to find the book value of private companies. Private companies were then given valuations similar to public companies based upon size and line of business. Real estate values were estimated by using recent valuations done by independent appraisers or by

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in 1992 and 1993 when several firms went bankrupt. 7 firms included in our study went bankrupt in 1992 and 1993.

6 The Affärsvärlden report for wealthy Swedes is equivalent to the Forbes Magazine report for wealthy Americans. However, because privacy laws aren’t as strict in Sweden, more information about individual wealth is part of the public domain. For example, personal tax forms—which include taxable wealth—were public information in 1988 and 1991.

7 In Sweden, manager held companies’ annual reports are publicly available.
approximating the value by the amount of assessments and rental revenues. Affärsvälden approximated the indebtedness of the owners by basing the loan values on the length of the time period the stock-holdings have been in the coalition’s possession. If the founder is still the major shareholder, then he or she is regarded as being debtless. In Sweden, both income and wealth are taxed. Examining taxable income and wealth refined indebtedness estimates. For example, if taxable wealth was substantially below the taxable value of an individual’s known assets the difference was attributed to debt. Also, if taxable income was below known income from dividends and salary the difference was assumed to be interest payments. Debt can then be estimated given an assumed interest rate. For individually controlled firms we calculate investment in firm as the market value of the individual’s equity in the firm divided by net wealth of the individual.

For institutionally controlled firms we approximate wealth by summing the market value of all of the holdings of the institutions in firms listed on the Stockholm Stock Exchange. Admittedly, in some cases this underestimates the portfolio holdings of institutions. For institutions, we calculate the investment in the firm as the market value of the institution’s equity in the firm divided by net wealth of the institution.

Table 2, panel A shows that shareholder’s proportional investment in the firm is 0.535 (0.519) on average (median) for individually controlled firms and 0.157 (0.044) for institutionally controlled firms. Thus the median individual owner has 52% of his wealth invested in the firm while the median institutional owner has 4% of its wealth invested in the firm. The median individual owner also has larger equity (34%) and vote (65%).
fractions in the firm than do the institutional owners (13% and 39%, respectively). Thus, individual owners appear to be more concerned with control than portfolio diversification and this is reflected in the control premium estimates discussed below. The mean vote ownership for the entire sample is 52% while the mean equity ownership is only 29%. Equity ownership is adjusted for pyramid structures and is estimated as the market value of the controlling shareholder’s net investment in the firm divided by the market value of firm equity. On average the largest shareholders control the firm (assuming majority rules) while owning significantly less than half of the equity. As we stated, in Sweden as opposed to the U.S. most companies have A and B shares, where A shares usually have ten times the voting power of the B shares, but are entitled to the same cash flow.

[Insert Table 2 about here]

3.2 Firm Characteristic Variables

The purpose of the empirical tests is to investigate how portfolio decisions are related to how the controlling owner values corporate control. We measure the firm’s capital structure as the book value of debt divided by the market value of total assets. The market value of total assets is estimated as the market value of equity plus the book value of debt. Included in the model are asset volatility and asset beta. Asset volatility is measured as market value of equity divided by the market value of total asset times the yearly standard deviation of equity. Asset beta is estimated as market value of equity divided by the market value of total assets times the beta of equity. Standard deviation of equity and beta of equity are estimated using daily data over four years preceding 1988 and 1991, respectively. Adjustments have been completed for the 1987 crash by deleting 20 trading
days starting October 19, 1987.\textsuperscript{8} In all these approximations it is assumed that debt is risk free.

We also define a number of other firm characteristic variables used in previous studies (e.g., Berger, Ofek, and Yermack (1997) and Titman and Wessels (1988)) as control variables in the cross sectional analysis. Size is measured as the natural logarithm of book value of total assets\textsuperscript{9}. Profitability is estimated as the 5-year average of earnings before interest and taxes divided by total assets. Asset collateral is estimated as the 5-year average of net plant, property, and equipment divided by total assets. Valuation is measured as the approximate q ratio, defined as the market value of equity plus the book value of debt divided by the book value of total assets.

Table 2 Panel B shows that the individually controlled firms on average have the same debt structure as institutionally controlled firms. This is surprising since the individuals have invested substantially more of their wealth in the firm. To decrease the risk of their personal portfolio they could have decreased the leverage in the firm. However, decreased leverage would also mean reduced control. The size of total assets and their beta is significantly smaller for individually controlled firms than for institutionally controlled firms while the difference between profitability, valuation, operational diversification, and asset collateral for individually and institutionally controlled firms is not statistically significant.

\textsuperscript{8} This adjustment does not qualitatively change the results.
\textsuperscript{9} Total Assets are deflated into 1991 prices by the consumer price index.
3.3 **Descriptive Simulations**

It is important to understand the control premium estimated in this paper and the following simulation provides some insight into this estimate and the way it varies with characteristics of the firm and the controlling shareholder. The simulation is based on the firm characteristics summarised in Table 2 with the control premium being defined equal to the Black Scholes value less the Lambert, Larcker and Verrecchia value of shares held by the shareholder. We assume that the asset value per share is SEK 100.00 and the market risk premium is 6% while constant relative risk aversion is set to values of one, two and three. The standard deviation of the underlying firm asset returns is 15.1% per annum, the risk free rate of return is 10%, the underlying asset beta is 0.22 and the firm ratio of debt to market value is 57%. Average shareholder total wealth is assumed equal to SEK million 1,276 with SEK million 421 invested in shares in the firm and the remainder of total wealth invested in risk free assets.\(^\text{10}\) For this example the Lambert, Larcker and Verrecchia values of shares is SEK million 459, SEK million 432 and SEK million 409 for relative risk aversion values of one, two and three while the Black Scholes value of the shares is SEK million 421. Thus for constant relative risk aversion parameters of one and two there are control “discounts” of 9% and 3% respectively and for the constant relative risk aversion parameter of three there is a control premium of 3%. The greater the level of shareholder risk aversion the greater the control premium that the shareholder faces. The discounts arise from the assumption that the remainder of wealth is invested in risk free assets. A risk averse shareholder would not choose to invest

\(^\text{10}\) The standard deviation, asset beta, total wealth, and value of investment in the firm correspond to the averages for the individually controlled firms (see table 2). The assumed risk free interest rate roughly corresponds to the Swedish Treasury Bill rate in 1988 and 1991.
in risk free assets alone and thus as the level of shares increases from zero there will initially be diversification gains from investing in the firm’s shares. Ultimately, as the level of investment in shares increases past the optimal level, losses will occur with further increases in shares. Thus our measure of control premium provides an approximation for control in cases where the shareholder holds a broader range of assets than the combination of risk free assets and the firm’s shares assumed here.

Figures 1, 2 and 3 highlight this variation in control premium given constant relative risk aversion parameters of one, two and three (note that the scale on the vertical axis differs between the figures). In Figure 1, with constant relative risk aversion of one, the shareholder would generally prefer to increase the level of shareholding in the firm regardless of leverage and the current level of wealth invested in the company. With an increase in the level of risk aversion to two (Figure 2) and then to three (Figure 3) it is apparent that with increasing levels of risk aversion shareholders become more sensitive to additional investment in the shares of the firm and there is clearly a cost to the shareholder of further investment in the firm. In figures 2 and 3 it is also apparent that leverage further increases the cost of control, i.e. the shareholder could reduce leverage to reduce the cost of control. However, this would also mean reduced control. It is these tradeoffs that we focus upon in this paper.

[Insert Figures 1, 2, and 3 here]

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11 This may be a reasonable approximation for the individual owners. For institutional owners with more or less diversified portfolios, however, it probably overestimates the benefits of diversification when increasing the number of shares invested in the firm.
The other variable in the model we do not have direct estimates of is the duration of the debt.\textsuperscript{13} We assume that we can approximate the firm’s debt with a zero coupon bond whose maturity and face value equal the firm’s debt duration and face value. In the analysis below we assume that the debt has duration of 10 years. To investigate how sensitive the model is to this assumption, we present simulations with constant relative risk aversion 2 and debt duration of 6 and 2 years, respectively, in figure 4 and 5 (compare to figure 2). The general shape of the control premium estimates is the same at different durations but at shorter duration the cost of poor diversification is more sensitive to leverage changes. Especially at high leverage ratios the probability of default decreases as duration decreases since the model assumes a positive drift in the market value of equity.

[Insert Figures 4 and 5 here]

4. Analysis

In this section we first present the average and median control premiums estimated for our sample assuming a constant relative risk aversion parameter of one, two, and three, respectively. Second, the sample is split according to the identity of the controlling owner, i.e. individuals or institutions. The individually controlled firms are investigated further by examining whether the founder and the founder’s family evaluates control differently from other individuals. Third, we run cross-sectional regressions to examine whether the control premium is correlated with ownership variables and firm

\textsuperscript{12} The reported debt to asset levels and level of poor diversification (fraction of wealth invested in the firm) roughly correspond to the distributions for our sample of individually controlled firms.

\textsuperscript{13} The Swedish annual reports contain very little information on the firms’ debt structure. In 1988 and 1991 it could also be argued that debt financing was mainly done by relationship banking with promises of refinancing at maturity. It is therefore difficult to approximate the actual duration of debt.
characteristics. Finally, we examine how the choice of external financing, debt or equity, of a hypothetical investment affects the control premium.

4.1 Estimated Control Premiums

Summary statistics for the control premium estimates for our sample are reported in Table 3, Panel A, for constant relative risk aversion values of one, two and three. The premium estimate increases in magnitude as the level of risk aversion increases. Further, consistent with the relative wealth invested in the individual firms the control premium is greater for individuals than for institutions. This is also consistent with larger benefits of control for individual owners. The mean (median) control premium estimates are significantly negative for CRRA 1 and 2, but significantly positive (not different from zero) for CRRA 3. For individually controlled firms the mean and median control premium is negative for CRRA 1 but positive for CRRA 2 and 3. For the institutionally controlled firms, the control premium is negative for all three CRRA values. The positive control premium observed for individuals is consistent with poor diversification while the negative premium observed for institutions suggests that institutions invest less in the individual firms than the risk-averse investor assumed here. Although the values appear reasonable the cross-section variation in the control premium is of most interest in this analysis.

[Insert table 3 about here]

To test whether the substantial control premium for the individually controlled firms are driven by a particular ownership group, we divide the individually controlled firms
according to whether the founder, the founder’s family (without the founder), or other individuals control the firm. The results are reported in table 3, Panel B. The results suggest that it is particularly founders who give up diversification of their personal portfolio to keep a controlling interest in the firm they once founded. The average control premium for founders is 12% (26%) at CRRA parameter 2 (3). The founder’s family also appear to give up diversification for control reasons. The estimated control premium for the founder’s family is 4.9% (15.3%) at CRRA parameter 2 (3). The difference tests confirm that a founder evaluates control significantly higher than owners who have no relation to the founder. The founder’s family appears to lie somewhere in between.

4.2 Cross-Sectional Regressions

To test whether our results indicating that individual owners in general, and founders in particular, give up diversification benefits in order to keep control of the company, are robust to missing variable biases we run cross-sectional regressions controlling for other ownership and firm characteristics. The dependent variable is the estimated control premium with CCRA parameters 1, 2, and 3, respectively. To differentiate between individual control and institutional control we use a dummy variable, INDIVIDUAL, which is equal to one if the controlling owner is an individual, and zero otherwise. Similarly, we use a dummy variable, FOUNDER, being equal to one if the controlling owner is the founder, and zero otherwise.

14 We do not include variables, which have been used in the estimation of the control premium, e.g. leverage, volatility, beta, and shareholder wealth.
Other ownership variables are VOTFR and DUALCLASS. VOTFR is equal to the controlling owner’s fraction of total votes. This variable will identify whether the controlling owner has to give up more diversification benefits if she wants to hold a larger vote fraction, i.e. whether the control benefits to the controlling owner increase with the size of the controlling block of votes in the company. Since dual class shares can be used to increase the vote fraction above the capital investment, we also include a dummy variable DUALCLASS, which is equal to one if the firms has dual class shares, and zero otherwise.

To control for firm characteristics we include the variables LSIZE, TOBINSQ, ROAM, RPPEAP, and SINGLSEG. It could be argued that the value of control should be higher in larger firms. We therefore include a firm size variable, LSIZE, which is equal to the natural logarithm of the book value of total assets. Further, it might be that investors who have put a large fraction of their wealth into one particular firm have done so because the firm has profitable growth opportunities. Profitable growth opportunities should be captured in the market value of the firm and we include an approximation of Tobin’s q to control for this possibility. TOBINSQ is equal to the market value of firm equity plus the book value of firm debt divided by the book value of total assets. If an investor has invested a large fraction in a particular firm and thereby given up valuable diversification benefits because she believes the firm has profitable growth opportunities, TOBINSQ should be positively correlated with the estimated control premium. Similarly, if an investor has accumulated shares because the firm has been performing well, the control premium should be positively correlated with historical performance. However, an
investor can also choose to divest his holdings while the firm is performing well. If that is the case, the control premium might be negatively related to historical performance. To control for historical performance we include the average Return On Assets (ROAM) over the passed five years. ROAM is equal to the five-year average of earnings before interest and taxes (EBIT) divided by the book value of total assets.

Additionally, we control for the firm’s asset structure. RPPEAP measures the average fraction of asset collateral (net plant, property, and equipment) to total assets over the past five years. It could be argued that the benefits of control are larger in a firm with little tangible assets, e.g. media. However, the risk associated with investing a large fraction of ones wealth in a firm with little tangible assets, is probably larger than the same investment in a firm with greater levels of tangible assets, ceteris paribus. Thus, the expected sign on the RPPEAP coefficient is unclear. Finally, SINGLSEG is a dummy variable being equal to one if the firm only reports activity within one industry segment, and zero otherwise. This variable should capture the possibility that the controlling owner diversifies the firm’s activities when she holds an undiversified personal portfolio. Thus, SINGLSEG should be negatively correlated with the control premium.

The results are reported in table 4. Our earlier results are also reflected in the cross-sectional regressions\(^{15}\), i.e. the INDIVIDUAL and FOUNDER variables are positive and significant. The coefficients indicate 8.7% (12.7%) higher value of control for individual

\(^{15}\) As the sample spans two years the OLS regressions are replicated using random effects panel regression, both balanced and unbalanced. The OLS results are essentially replicated for the unbalanced panel analysis. Some data points are lost in conducting the balanced panel analysis and while the VOTFR results
owners and an additional 9% (14%) for founder controlled firms at CRRA parameter 2 (3). The VOTFR variable indicates that control oriented owners are willing to give up diversification benefits in order to increase their vote fraction in the firm. Thus, the value of control is positively correlated with the size of the controlling block. Surprisingly, the insignificance of DUALCLASS indicates that the cost of control is not reduced by a dual class share structure. Furthermore, the negative significance of LSIZE suggests that the value of control is negatively correlated with size. A possible explanation is that the private benefits of control is reduced in larger firms since they are more transparent and outside shareholders are more active in larger firms. In medium sized and small firms it is easier for the controlling owner to make pivotal decisions concerning allocation of financial and non-financial resources and people within a firm without the obstruction from outside shareholders. Finally, the statistically significant negative parameter for TOBINSQ in model 1 and the negative coefficients in the other variables indicate that the controlling owners do not hold a large fraction of their wealth in one firm because the firm has valuable growth opportunities. ROAM, RPPEAP, and SINGLSEG are not statistically significant.

A limitation with our approach is that we assume the same CRRA parameter for all firms in the sample and the chosen parameters influence the estimated control premiums. Most likely, different investors have different levels of risk aversion. However, it is difficult to believe that institutions are significantly more risk averse than individuals, which would remain significant there is a reduction in the level of statistical significance for the founder and individual parameters. The results of these separate regressions are available on request.
explain the different control premiums. It is also difficult to believe that founders should be significantly less risk averse than other individuals.

4.3 Choice of External Financing and the Control Premium

In this section we hypothesise that the firm is considering a new major investment, which requires external financing. The investment is equal to 10 percent of the market value of the firm’s existing assets and for simplicity we assume that the new project has NPV=0. We assume that this financing can be raised with a rights issue of equity or by issuing new debt. It is assumed that the controlling owner takes up all of the rights allocated to him under the rights issue. We do not consider public issues or private placements of equity because this would dilute the controlling owner’s position.

In a rights issue, the controlling owner has to invest more of his wealth in the firm, i.e. his personal portfolio will be less diversified. On the other hand, firm leverage is reduced. If the investment is financed by debt, the controlling owner’s personal portfolio is unaffected but firm leverage increases. By comparing the control premium after a rights issue and after debt financing, directly against the preinvestment control premium, we shed light on how the controlling owner views the two financing strategies with respect to his own personal portfolio and with respect to firm leverage.

The results of our simulations are reported in Table 5. The median change in control premium is estimated as the change in SEK terms, i.e. a positive (negative) number
means that the control premium is larger (smaller) after the investment than before. Panel A reports the median change in the control premium for the individually controlled firms. While debt financing only marginally increases the control premium, a rights issue doubles the control premium at CRRA 2 and 3. Since the individual owners on average already have a large fraction of their wealth invested in the firm before the rights issue, this is not surprising. For the institutional owners (see Panel B), the effect is reversed. First, both debt financing and a rights issue decrease the control premium. Furthermore, equity financing reduces the control premium significantly more than debt financing. These results stem from the assumption that the wealth not invested in the firm, is invested to the risk free rate. Thus, the simulations suggest that, on average, individual owners will choose to finance new investment with debt while institutional owners prefer rights issues.

We test this hypothesis by collecting information about rights issues made by the firms in our sample. We follow the sample firms for 3 years after our sample points. For the observations from 1988 (1991) we examine whether they have made any rights issues 1989-1991 (1992-1994). The frequency of identified rights issues is reported in panel C. It is apparent that there is no statistically significant difference between the proportion of the individually controlled firms making rights issues (0.115) and the proportion of institutionally controlled firms making rights issues (0.092). Though this test is somewhat limited the results are inconsistent with our hypothesis that individual owners prefer debt issues to rights issues. On further analysis, it is evident that it is not the individual owners with relatively low control premiums that make rights issues. There is no significant

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16 Only the medians are reported since the distributions are skewed.
difference in control premiums for owners who choose to make rights issues and those who do not (not reported here).

A possible explanation for this result is that if the capital is raised by means of a rights issue, the owner pays the cost of reduced diversification but there is no change in the control of the firm. If debt is issued the lender may interfere with the management of the firm. Thus, at a rights issue the controlling owner has to supply extra capital but is able to run the firm without any new interference. This could explain why individual owners with poorly diversified portfolios still choose to raise capital by means of rights issues.

5. Summary and Conclusions

Why do investors give up valuable diversification benefits and instead invest a large fraction of their wealth in one firm in order to be the controlling shareholder? And why do controlling shareholders increase (do not decrease) leverage when this further increases the risk of their personal portfolio? The reason must be valuable control benefits (Zingales (1994)). This paper approximates the value of corporate control in a novel way. We model and test the value of an investment portfolio to a control-oriented, poorly diversified risk-averse shareholder in the firm. The Lambert, Larcker and Verrecchia (1991) executive compensation model is extended to include the impact of leverage and consequently applied to value shares in the firm. While this model provides an estimate of the value of a share to a poorly diversified risk-averse shareholder, the Black and Scholes (1973) option pricing model provides an estimate of the market value of the share. The difference between the value to the shareholder and the value in the
market gives an estimate of the cost of poor diversification and/ or leverage to the shareholder.

We estimate control premiums for a sample of large Swedish firms for which direct estimates of the controlling owners’ wealth are available. We find that the value of control is substantial for individual owners in general, and for the founder in particular. At a Constant Relative Risk Aversion parameter of 2 (3), the average control premium for founders is 12% (25%). The value of control also increases with the magnitude of the voting control and decreases with firm size.
References


Hall, Brian and Kevin Murphy, 2000b, “Share options for Undiversified Executives”, working paper, November, 1-49.


La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer. 1999, “Corporate ownership around the world”, *Journal of Finance*, 54, 471-517.


The sample used in this study consists of Swedish firms listed on the Stockholm Stock Exchange (the A-list, the OTC, or the Unofficial list) 1988 and 1991. N=232. Firms are defined as individually controlled if the largest shareholder is the founder, the founder’s family, entrepreneurs or employees. An individual or a group of individuals, which are not employees and do not have any family relation to the founder, is defined as an entrepreneur. Firms controlled either by financial institutions, public corporations, foundations, associations, the state or a community are defined as being institutionally controlled. Non-profit organizations are defined as associations. If the majority owner is another corporation, it is defined as ownership by a public corporation.

<table>
<thead>
<tr>
<th>Identity of largest (controlling) shareholder</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individually controlled firms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Founder/CEO owns and manages the firm</td>
<td>30</td>
<td>12.9</td>
</tr>
<tr>
<td>Founder’s family (without founder) owns and manages the firm</td>
<td>27</td>
<td>11.6</td>
</tr>
<tr>
<td>Founder’s family no longer active in the firm</td>
<td>56</td>
<td>24.0</td>
</tr>
<tr>
<td>(Firm controlled by employees or an entrepreneur)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutionally controlled firms</td>
<td>119</td>
<td>51.5</td>
</tr>
<tr>
<td>Financial Institution</td>
<td>54</td>
<td>23.2</td>
</tr>
<tr>
<td>Public Corporation</td>
<td>33</td>
<td>14.2</td>
</tr>
<tr>
<td>Foundation</td>
<td>5</td>
<td>2.1</td>
</tr>
<tr>
<td>State or Community</td>
<td>11</td>
<td>4.7</td>
</tr>
<tr>
<td>Association</td>
<td>17</td>
<td>7.3</td>
</tr>
</tbody>
</table>
Table 2
Firm and Ownership Characteristics

The sample used in this study consists of Swedish firms listed on the Stockholm Stock Exchange (the A-list, the OTC, or the Unofficial list) in 1988 and 1991. N=232. Firms are defined as individually controlled if the largest shareholder is the founder, the founder’s family, entrepreneurs or employees (N=113). An individual or a group of individuals, which are not employees and do not have any family relation to the founder, is defined as an entrepreneur. Firms controlled either by financial institutions, public corporations, foundations, associations, the state or a community are defined as being institutionally controlled (N=119). Non-profit organizations are defined as associations. If the majority owner is another corporation, it is defined as ownership by a public corporation.

Panel A: Ownership characteristics: Market Value (MV) of the largest shareholder’s actual ownership in the firm in million SEK, the largest shareholder’s total wealth in million SEK (For the individually controlled firms, the controlling shareholder’s total wealth is collected from the tax statements. For the institutionally controlled firms total wealth is approximated by the total value of their investment on the Stockholm Stock Exchange), the largest shareholder’s investment in the firm, i.e. the percentage of total wealth invested in the firm, the market value of the largest shareholder’s actual equity stake divided by the market value of the firm’s equity, and the vote percentage of the largest shareholder. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

<table>
<thead>
<tr>
<th></th>
<th>Total sample</th>
<th>Individual Controlled</th>
<th>Institutional Controlled</th>
<th>Mean diff t-test</th>
<th>Median diff Wilcoxon Rank-sum test</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV largest shareholder’s stake</td>
<td>493</td>
<td>248</td>
<td>421</td>
<td>173</td>
<td>-1.719*</td>
</tr>
<tr>
<td></td>
<td>Total Wealth largest shareholder</td>
<td>7571</td>
<td>2379</td>
<td>1276</td>
<td>-14.059***</td>
</tr>
<tr>
<td></td>
<td>Investment in Firm</td>
<td>0.341</td>
<td>0.145</td>
<td>0.535</td>
<td>6.846***</td>
</tr>
<tr>
<td></td>
<td>Equity largest shareholder</td>
<td>0.286</td>
<td>0.247</td>
<td>0.373</td>
<td>6.674***</td>
</tr>
<tr>
<td></td>
<td>Vote largest shareholder</td>
<td>0.519</td>
<td>0.515</td>
<td>0.611</td>
<td>6.482***</td>
</tr>
</tbody>
</table>

Panel B: Firm characteristics: Debt to Asset ratio (market values), Total Assets (Book Values) in million SEK, the yearly volatility of the firm’s asset returns (estimated over four years), the asset beta (estimated over four years), Tangible Assets (Inventory, Plant, and Equipment)/ Total Assets (5 year average), Return on Asset (5-year average), Market to Book ratio, and the approximate q ratio. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

<table>
<thead>
<tr>
<th></th>
<th>Total sample</th>
<th>Individual Controlled</th>
<th>Institutional Controlled</th>
<th>Mean diff t-test</th>
<th>Median diff Wilcoxon Rank-sum test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt/ Total Asset</td>
<td>0.572</td>
<td>0.576</td>
<td>0.570</td>
<td>0.558</td>
<td>-0.851</td>
</tr>
<tr>
<td></td>
<td>Total Assets</td>
<td>8352</td>
<td>2752</td>
<td>3386</td>
<td>-5.275***</td>
</tr>
<tr>
<td></td>
<td>Asset value volatility</td>
<td>0.146</td>
<td>0.141</td>
<td>0.151</td>
<td>1.034</td>
</tr>
<tr>
<td></td>
<td>Asset Beta</td>
<td>0.256</td>
<td>0.221</td>
<td>0.221</td>
<td>-2.829***</td>
</tr>
<tr>
<td></td>
<td>Tangible Assets/ Total Assets</td>
<td>0.248</td>
<td>0.243</td>
<td>0.248</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td>Return on Asset</td>
<td>0.074</td>
<td>0.072</td>
<td>0.073</td>
<td>-0.075</td>
</tr>
<tr>
<td></td>
<td>Approximate q ratio</td>
<td>1.369</td>
<td>1.215</td>
<td>1.382</td>
<td>0.342</td>
</tr>
</tbody>
</table>
Table 3
Estimated Control Premiums

The sample used in this study consists of Swedish firms listed on the Stockholm Stock Exchange (the A-list, the OTC, or the Unofficial list) in 1988 and 1991. N=232. Firms are defined as individually controlled if the largest shareholder is the founder, the founder’s family, entrepreneurs or employees (N=113). An individual or a group of individuals, which are not employees and do not have any family relation to the founder, is defined as an entrepreneur. Firms controlled either by financial institutions, public corporations, foundations, associations, the state or a community are defined as being institutionally controlled (N=119). Non-profit organizations are defined as associations. If the majority owner is another corporation, it is defined as ownership by a public corporation. The control premium, estimated in terms of reduced diversification, is estimated by subtracting the value of shares in the hands of a poorly diversified risk-averse controlling shareholder (Lambert, Larcker and Verrecchia, 1991) from the market value of the shares (Black and Scholes, 1973). A negative value means that the Lambert, Larcker and Verrecchia value is higher than the Black and Scholes’ value. ***, **, and * denote significance differences at the 1%, 5%, and 10% level, respectively.

Panel A: Estimated control premiums for the total sample, individually controlled firms, and institutionally controlled firms, respectively.

<table>
<thead>
<tr>
<th>Total sample</th>
<th>Individual Controlled</th>
<th>Institutional Controlled</th>
<th>Mean diff t-test</th>
<th>Median diff Wilcoxon Rank-sum test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Median</td>
<td>Mean Median</td>
<td>Mean Median</td>
<td>Mean Median</td>
<td></td>
</tr>
<tr>
<td>Control Premium, CRRA = 1</td>
<td>-0.094 -0.077</td>
<td>-0.039 -0.032</td>
<td>-0.146 -0.144</td>
<td>4.728***</td>
</tr>
<tr>
<td>Control Premium, CRRA = 2</td>
<td>-0.029 -0.043</td>
<td>0.051 0.035</td>
<td>-0.105 -0.115</td>
<td>5.741***</td>
</tr>
<tr>
<td>Control Premium, CRRA = 3</td>
<td>0.031 -0.005</td>
<td>0.143 0.085</td>
<td>-0.073 -0.110</td>
<td>6.411***</td>
</tr>
</tbody>
</table>
Panel B: Estimated control premiums for the privately controlled firms split according to whether the founder still controls the firm (is CEO) (N=30), the founder’s family (without the founder) controls the firms (N=27), or other individuals control the firm (N=56), respectively.

<table>
<thead>
<tr>
<th></th>
<th>1. Founder</th>
<th>2. Founder family</th>
<th>3. Other</th>
<th>1-2 (Diff. test) Mean</th>
<th>1-2 (Diff. test) Median</th>
<th>2-3 (Diff. test) Mean</th>
<th>2-3 (Diff. test) Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Premium, CRRA = 1</td>
<td>-0.014</td>
<td>-0.004</td>
<td>-0.041</td>
<td>-0.036</td>
<td>-0.050</td>
<td>-0.048</td>
<td>0.703</td>
</tr>
<tr>
<td>Control Premium, CRRA = 2</td>
<td>0.122</td>
<td>0.096</td>
<td>0.049</td>
<td>0.045</td>
<td>0.017</td>
<td>-0.001</td>
<td>1.497</td>
</tr>
<tr>
<td>Control Premium, CRRA = 3</td>
<td>0.258</td>
<td>0.235</td>
<td>0.153</td>
<td>0.147</td>
<td>0.082</td>
<td>0.028</td>
<td>1.464</td>
</tr>
</tbody>
</table>
Table 4
Cross-Sectional Regressions on the Estimated Control Premiums

The sample used in this study consists of Swedish firms listed on the Stockholm Stock Exchange (the A-list, the OTC, or the Unofficial list) in 1988 and 1991. N=232. The estimated control premiums with constant relative risk aversion parameter (CRRA) 1, 2 and 3, respectively are dependent variables. The control premiums, estimated in terms of reduced diversification, is estimated by subtracting the value of shares in the hands of a poorly diversified risk-averse controlling shareholder (Lambert, Larcker and Verrecchia, 1991) from the market value of the shares (Black and Scholes, 1973). A negative value means that the Lambert, Larcker and Verrecchia value is higher than the Black and Scholes’ value. Regression coefficients are reported with heteroscedasticity robust t-statistics in parenthesis (White, 1980). ***, **, and * denote significance at the 1%, 5%, and 10% respectively. INDIVIDUAL is equal to one if the controlling owner (i.e. largest shareholder) is an individual, a group of individuals or a family, and zero otherwise. FOUNDER is equal to one if the founder is the controlling owner, and zero otherwise. VOTFR is equal to the controlling owner’s fraction of total votes. DUALCLASS is equal to one if the firm has dual class shares, and zero otherwise. LSIZE is equal to the natural logarithm of the book value of total assets. TOBINSQ is equal to the market value of total assets (market value of equity plus book value of debt) divided by the book value of total assets. RPPEAP is equal to the five-year average of the value of inventory, plant and equipment divided by the book value of total assets. ROAM is equal to the five-year average of earnings before interest and taxes (EBIT) divided by the book value of total assets. SINGLSEG is equal to one if the firm is active in only one industry, and zero otherwise.

<table>
<thead>
<tr>
<th></th>
<th>CRRA=1</th>
<th>CRRA=2</th>
<th>CRRA=3</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
<td>0.2259</td>
<td>0.2533</td>
<td>0.2217</td>
</tr>
<tr>
<td></td>
<td>(1.566)</td>
<td>(1.374)</td>
<td>(0.923)</td>
</tr>
<tr>
<td>INDIVIDUAL</td>
<td>0.0634</td>
<td>0.0874</td>
<td>0.1274</td>
</tr>
<tr>
<td></td>
<td>(2.806)**</td>
<td>(2.929)**</td>
<td>(3.527)**</td>
</tr>
<tr>
<td>FOUNDER</td>
<td>0.0461</td>
<td>0.0903</td>
<td>0.1434</td>
</tr>
<tr>
<td></td>
<td>(1.296)</td>
<td>(1.976)**</td>
<td>(2.196)**</td>
</tr>
<tr>
<td>VOTFR</td>
<td>0.1281</td>
<td>0.1563</td>
<td>0.1873</td>
</tr>
<tr>
<td></td>
<td>(2.520)**</td>
<td>(2.610)**</td>
<td>(2.535)**</td>
</tr>
<tr>
<td>DUALCLASS</td>
<td>-0.0385</td>
<td>-0.0117</td>
<td>0.0054</td>
</tr>
<tr>
<td></td>
<td>(-1.115)</td>
<td>(-0.299)</td>
<td>(0.124)</td>
</tr>
<tr>
<td>LSIZE</td>
<td>-0.0185</td>
<td>-0.0234</td>
<td>-0.0226</td>
</tr>
<tr>
<td></td>
<td>(-2.097)**</td>
<td>(-2.204)**</td>
<td>(-1.674)*</td>
</tr>
<tr>
<td>TOBINSQ</td>
<td>-0.0862</td>
<td>-0.0654</td>
<td>-0.0612</td>
</tr>
<tr>
<td></td>
<td>(-2.831)**</td>
<td>(-1.638)</td>
<td>(-1.385)</td>
</tr>
<tr>
<td>ROAM</td>
<td>-0.0825</td>
<td>-0.1621</td>
<td>-0.2442</td>
</tr>
<tr>
<td></td>
<td>(-0.251)</td>
<td>(-0.459)</td>
<td>(-0.600)</td>
</tr>
<tr>
<td>RPPEAP</td>
<td>0.0421</td>
<td>0.1313</td>
<td>0.2197</td>
</tr>
<tr>
<td></td>
<td>(0.569)</td>
<td>(1.477)</td>
<td>(1.852)*</td>
</tr>
<tr>
<td>SINGLSEG</td>
<td>-0.0121</td>
<td>0.0086</td>
<td>0.0149</td>
</tr>
<tr>
<td></td>
<td>(-0.460)</td>
<td>(0.279)</td>
<td>(0.396)</td>
</tr>
<tr>
<td>Adj R² (%)</td>
<td>16.44</td>
<td>18.74</td>
<td>21.18</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>1.31</td>
<td>1.31</td>
<td>1.31</td>
</tr>
<tr>
<td>Highest VIF</td>
<td>1.65</td>
<td>1.65</td>
<td>1.65</td>
</tr>
</tbody>
</table>
Table 5
Choice of External Financing and its Effect on Control Premiums

The sample used in this study consists of Swedish firms listed on the Stockholm Stock Exchange (the A-list, the OTC, or the Unofficial list) in 1988 and 1991. N=232. Firms are defined as individually controlled if the largest shareholder is the founder, the founder’s family, entrepreneurs or employees (N=113). An individual or a group of individuals, which are not employees and do not have any family relation to the founder, is defined as an entrepreneur. Firms controlled either by financial institutions, public corporations, foundations, associations, the state or a community are defined as being institutionally controlled (N=119). Non-profit organizations are defined as associations. If the majority owner is another corporation, it is defined as ownership by a public corporation.

The control premium, estimated in terms of reduced diversification, is estimated by subtracting the value of shares in the hands of a poorly diversified risk-averse controlling shareholder (Lambert, Larcker and Verrecchia, 1991) from the market value of the shares (Black and Scholes, 1973). A negative value means that the Lambert, Larcker and Verrecchia value is higher than the Black and Scholes’ value. In this table we investigate the different effects of debt and equity financing. We assume a NPV = 0 investment equal to 10% of the total value of the firm. The firm can choose between debt financing and equity financing in form of a rights issue. If the firm chooses debt financing the controlling owner’s personal portfolio is unaffected but firm leverage increases. If the firm chooses a rights issue (we assume that the control owners use all their rights), the controlling owner must invest more of his wealth in the firm. At the same time, firm leverage is reduced. We report and test the median change in the control premium given debt and equity financing, respectively, of the assumed investment. We only report the medians due to skewed distributions. Median differences tested by Wilcoxon Sign rank test. ***, **, and * denote significant differences at the 1%, 5%, and 10% level, respectively.

Panel A: Change in control premium for individually controlled firms, N=113

<table>
<thead>
<tr>
<th></th>
<th>Debt Financing</th>
<th>Equity Financing</th>
<th>Difference Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median change in control premium, CRRA = 1</td>
<td>0.016</td>
<td>0.303</td>
<td>-4.342***</td>
</tr>
<tr>
<td>Median change in control premium, CRRA = 2</td>
<td>0.061</td>
<td>0.540</td>
<td>-3.373***</td>
</tr>
<tr>
<td>Median change in control premium, CRRA = 3</td>
<td>0.057</td>
<td>0.540</td>
<td>-2.376**</td>
</tr>
</tbody>
</table>

Panel B: Change in control premium for institutionally controlled firms, N=119

<table>
<thead>
<tr>
<th></th>
<th>Debt Financing</th>
<th>Equity Financing</th>
<th>Difference Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median change in control premium, CRRA = 1</td>
<td>-0.117</td>
<td>-0.150</td>
<td>5.309***</td>
</tr>
<tr>
<td>Median change in control premium, CRRA = 2</td>
<td>-0.132</td>
<td>-0.140</td>
<td>5.635***</td>
</tr>
<tr>
<td>Median change in control premium, CRRA = 3</td>
<td>-0.079</td>
<td>-0.123</td>
<td>5.253***</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Total Sample</th>
<th>Individually Controlled</th>
<th>Institutionally Controlled</th>
<th>Prop Diff Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rights Issue</td>
<td>24</td>
<td>0.103</td>
<td>13</td>
<td>0.115</td>
</tr>
</tbody>
</table>
Figure 1
Control Premium Estimate with Constant Relative Risk Aversion Parameter of One
and Time to Maturity of Ten Years

Note:
Each line represents the change in the control premium (the Black Scholes value less the Lambert, Larcker and Verrecchia value of shares) for a given level of investment in the shares of the firm ranging from 30% to 80% of total wealth. Debt to assets reflects the level of zero coupon debt as a percentage of the market value of assets, ranging from 30% to 80%. The control premium estimate ($'s) is defined equal to the Black Scholes based estimate of the market value of the shares (BS value) less the Lambert, Larcker and Verrecchia based value of the shares to the shareholder (LLV value). The control premium percentage (control premium %) is the control premium as a percentage of the Black Scholes value of the shares. It is assumed that underlying firm asset return standard deviation is 15.1%, beta is 0.22 and the level of debt to assets varies from 30% to 80%. The risk free rate is 10% and the risk premium is 6%. The underlying asset price is SEK100.00 per share. The shareholder has total wealth of SEK million 1,276 and the proportion of total wealth invested in shares is varied from 30% to 80%.
Figure 2
Control Premium Estimate with Constant Relative Risk Aversion Parameter of Two
and Time to Maturity of Ten Years

Note:
Each line represents the change in the control premium (the Black Scholes value less the Lambert, Larcker and Verrecchia value of shares) for a given level of investment in the shares of the firm ranging from 30% to 80% of total wealth. Debt to assets reflects the level of zero coupon debt as a percentage of the market value of assets, ranging from 30% to 80%. The control premium estimate (S’s) is defined equal to the Black Scholes based estimate of the market value of the shares (BS value) less the Lambert, Larcker and Verrecchia based value of the shares to the shareholder (LLV value). The control premium percentage (control premium %) is the control premium as a percentage of the Black Scholes value of the shares. It is assumed that underlying firm asset return standard deviation is 15.1%, beta is 0.22 and the level of debt to assets varies from 30% to 80%. The risk free rate is 10% and the risk premium is 6%. The underlying asset price is SEK100.00 per share. The shareholder has total wealth of SEK million 1,276 and the proportion of total wealth invested in shares is varied from 30% to 80%.
Figure 3
Control Premium Estimate with Constant Relative Risk Aversion Parameter of Three and Time to Maturity of Ten Years

Note:
Each line represents the change in the control premium (the Black Scholes value less the Lambert, Larcker and Verrecchia value of shares) for a given level of investment in the shares of the firm ranging from 30% to 80% of total wealth. Debt to assets reflects the level of zero coupon debt as a percentage of the market value of assets, ranging from 30% to 80%. The control premium estimate ($') is defined equal to the Black Scholes based estimate of the market value of the shares (BS value) less the Lambert, Larcker and Verrecchia based value of the shares to the shareholder (LLV value). The control premium percentage (control premium %) is the control premium as a percentage of the Black Scholes value of the shares. It is assumed that underlying firm asset return standard deviation is 15.1%, beta is 0.22 and the level of debt to assets varies from 30% to 80%. The risk free rate is 10% and the risk premium is 6%. The underlying asset price is SEK100.00 per share. The shareholder has total wealth of SEK million 1,276 and the proportion of total wealth invested in shares is varied from 30% to 80%.
Figure 4
Control Premium Estimate with Constant Relative Risk Aversion Parameter of Two
and Time to Maturity of Six Years

Note:
Each line represents the change in the control premium (the Black Scholes value less the Lambert, Larcker and Verrecchia value of shares) for a given level of investment in the shares of the firm ranging from 30% to 80% of total wealth. Debt to assets reflects the level of zero coupon debt as a percentage of the market value of assets, ranging from 30% to 80%. The control premium estimate ($) is defined equal to the Black Scholes based estimate of the market value of the shares (BS value) less the Lambert, Larcker and Verrecchia based value of the shares to the shareholder (LLV value). The control premium percentage (control premium %) is the control premium as a percentage of the Black Scholes value of the shares. It is assumed that underlying firm asset return standard deviation is 15.1%, beta is 0.22 and the level of debt to assets varies from 30% to 80%. The risk free rate is 10% and the risk premium is 6%. The underlying asset price is SEK100.00 per share. The shareholder has total wealth of SEK million 1,276 and the proportion of total wealth invested in shares is varied from 30% to 80%.
Figure 5
Control Premium Estimate with Constant Relative Risk Aversion Parameter of Two and Time to Maturity of Two Years

Note:
Each line represents the change in the control premium (the Black Scholes value less the Lambert, Larcker and Verrecchia value of shares) for a given level of investment in the shares of the firm ranging from 30% to 80% of total wealth. Debt to assets reflects the level of zero coupon debt as a percentage of the market value of assets, ranging from 30% to 80%. The control premium estimate ($'s) is defined equal to the Black Scholes based estimate of the market value of the shares (BS value) less the Lambert, Larcker and Verrecchia based value of the shares to the shareholder (LLV value). The control premium percentage (control premium %) is the control premium as a percentage of the Black Scholes value of the shares. It is assumed that underlying firm asset return standard deviation is 15.1%, beta is 0.22 and the level of debt to assets varies from 30% to 80%. The risk free rate is 10% and the risk premium is 6%. The underlying asset price is SEK100.00 per share. The shareholder has total wealth of SEK million 1,276 and the proportion of total wealth invested in shares is varied from 30% to 80%.