The diversification cost of large, concentrated equity stakes. How big is it? Is it justified?[*]

Bernt Arne Ødegaard

January 2009

Abstract

While the hypothesis that ownership concentration can affect the value of a company has seen a lot of empirical study, little light has been shed on a complementary problem, that these concentrated owners have a *cost* of their position due to an undiversified portfolio. Using a unique data set of the actual diversification of all Norwegian equity owners, we show that the largest owners of a corporation in fact have very undiversified equity portfolios, and that such owners have significant costs to their concentrated portfolios. At the level of risk of a benchmark portfolio, if they were to move from their present portfolio composition in risky assets to a well diversified portfolio, their returns would have increased by about 13 percentage points in annual terms. We ask whether this cost can be explained by estimated benefits of ownership concentration (private benefits), and show that extant estimates of private benefits are too low to offset our cost estimates.

JEL Codes: G10, G30
Keywords: Portfolio diversification, Large equity owners, Costs and benefits of equity ownership concentration, Private benefits.

Introduction

Partial concentration of ownership and control in the hands of one or a few investors is one of the five alternative control mechanisms for resolving the collective action problem at the heart of the corporate governance problem (Becht, Bolton, and Roell, 2003, pg 4). The theory of ownership concentration is based on a tradeoff between risk diversification, which increases when ownership becomes more disperse, and optimal monitoring incentives, which need concentrated ownership. Theoretical analysis (Admati, Pfleiderer, and Zechner, 1994; Maug, 1998) suggests that this tradeoff leads to undersupply of monitoring, due to the classical free-riding intuition: The concentrated owners suffers the costs, but do not get all of the benefits, since improved monitoring increases the value of the firm to all its owners. A possible offsetting effect is the potential for large owners to collude with management to the detriment of the other shareholders.[1]

A huge empirical literature has analyzed aspects of this issue. The most prominent asks the question: Does ownership concentration matter for corporate performance? The typical finding

---

[1] Tirole (2006) summarizes much of the theoretical literature on these issues.

is that firm performance varies with ownership concentration and owner type.[2] Another strand of literature has asked whether large owners have private benefits of control, inferred either from block premia (Barclay and Holderness, 1989)[3] or superior voting shares (Lease, McConnell, and Mikkelson, 1983).[4]

There is however very little empirical work which has looked directly at one component of the tradeoff facing an owner when he decides to become large, namely the portfolio diversification implications of taking a large stake. For an owner to influence a company his stake in the company has to be large enough that his voice is heard and acted on. This imposes a cost on the owner. For any owner with limited wealth a large stake in any one company reduces the funds available for other equity investments. This "diversification loss" has been used as an argument in theoretical settings, but has seen little empirical investigation. The reason is obvious. To say something about these issues one needs information about the wealth of a given owner and the owner's complete equity portfolio. To empirically describe this diversification loss is the contribution of the present paper.

Using an unique dataset which contains the equity holdings of all investors at the Oslo Stock Exchange over a 14 year period, we characterize the actual portfolios of the largest owners. We show that the largest owner in a company is very undiversified. The median such owner has an equity portfolio containing only four stocks, with 88% of that owner's equity wealth invested in one company. These numbers vary by owner type. The most diversified are financial owners (which presumably have less of a wealth constraint), which have a median of 34 firms in their portfolio, and 9% of their wealth invested in the firm in which they are the largest owner. On the other hand, an individual non-corporate owner has a median of 3 firms in his portfolio and close to 100% of his wealth invested in one company. These owners in particular are under-diversified.

These observations motivates our construction of a measure of the economic importance of the diversification loss suffered by investors taking a large equity stake. We do this by, in a mean variance setting, looking at how an investor could improve his portfolio tradeoff by moving from his present portfolio composition to a well diversified benchmark, such as a market portfolio, keeping the portfolio volatility constant. Across all the owners in the sample such a move would have increased expected returns by 13 percentage points in annual terms.

We then go on to look in more detail at the decision problem facing individual investors, and ask whether the observed diversification loss for the financial part of the portfolio can be explained as the outcome of a rational decision by these owners, by first showing how the financial part of the portfolio fits into the total portfolio problem of such investors, and then using the estimates of diversification loss found in this paper to compare with extant estimates of benefits of ownership concentration (private benefits). We find that the literature's estimates of private benefits are an order of magnitude lower than is necessary to offset the diversification losses we find. If we believe that the concentration choices we observe in this paper are outcomes of a rational weighting of costs and benefits, this must mean that the benefits of ownership concentration are much larger than previously thought.

Due to the special nature of our data, there is very little comparable evidence in the literature. There is some work looking at diversification of individual investors,[5] but this literature do not specifically consider the largest owners, the owners where the wealth constraint is most likely

---

[2]The starting points for this literature are Demsetz and Lehn (1985), Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990). Gugler (2001) summarizes much of this literature. Bøhren and Ødegaard (2006) gives evidence on this issue using Norwegian data.

[3]See Dyck and Zingales (2004) for a recent example of this kind os study, and a summary of the literature.

[4]For a summary of the literature on superior voting shares, see the survey articles by Burkhart and Lee (2008) and Adams and Ferreira (2008). See Ødegaard (2007b) for some evidence on superior voting shares in Norway.

[5]See for example Blume and Friend (1975), Barber and Odean (2000), Goetzmann and Kumar (2005), Polkovichenko (2002) and Kumar (2005).

to be a factor. There is some related work using data from Sweden, where it is also possible to construct the portfolios of individual owners. For example, Holmen, Knopf, and Peterson (2003, 2007) construct the portfolios of managerial owners of Swedish firms for two years, 1988 and 1991. They then ask whether the portfolio concentration of the owners seem important for corporate decisions. Bodnaruk, Kandel, Massa, and Simonov (2008) uses data on owner diversification to look at the IPO decision. Our focus is different. Our long time series of data allows us to attack the issues in a different way, by taking the asset pricing route.

The rest of the paper is organized as follows. Section 1 describes the market and data. In section 2 we describe the level of diversification for the largest owners, and show how it depends on the owner type. In section 3 we ask whether the under-diversification is economically significant by estimating a diversification loss. In section 4 we look at individual investors, and ask whether their diversification losses can be explained by extant estimates of the benefits of ownership concentration, Section 5 summarizes and concludes the paper.

1 Market and Data

The firms in the sample are listed on the Oslo Stock Exchange (OSE), which is a moderately sized exchange by international standards. In 1997, the 217 listed firms had an aggregate market capitalization which ranked the OSE twelfth among the 21 European stock exchanges for which comparable data is available. In terms of investor protection La Porta, Lopez-de Silanes, Shleifer, and Vishny (1998) puts Norway at the average of countries in the Scandinavian group. The Scandinavian legal tradition is between the US and European traditions, with relatively strong investor protection.[6]

This paper uses data from the Norwegian equity market for the period 1989 through 2006. We use three types of data. One is data on corporate ownership from the Norwegian Securities Registry (VPS). From this source we use annual observations of the equity holdings of the complete stock market. At each date we observe the number of stocks owned by every owner. Each owner has a unique identifier which allows us to construct the equity portfolio of that owner. Note that our data only contains the equity part of an owner's portfolio, we do not have data on any other investments. For each owner the data include a sector code that allows us to distinguish between such types as mutual fund owners, financial owners (which include mutual funds), industrial (nonfinancial corporate) owners, private (individual) owners, state owners[7] and foreign owners.[8]

In addition to the data on equity ownership we use market data from the Oslo Stock Exchange Data Service (OBI). This source provides stock prices and accounting data allowing the construction of return series. We only include companies whose stocks satisfy a minimum level of liquidity.[9] Finally, we use interest rate data from Norges Bank, the Central Bank of Norway.

---

[6]A detailed description of the Norwegian stock market and Norwegian corporate governance regulations can be found in Bøhren and Ødegaard (2000, 2001).

[7]In the analysis we remove state owners. The government is likely to have other agendas than private investors, and is also less likely to care about diversification costs and benefits. We therefore leave out the cases of large state ownership.

[8]We do not have detailed data on all of the foreign owner's portfolios. Some of the foreign equity positions are only listed indirectly, the ownership is done through nominee accounts with large international investment banks. We do not have access to the breakdown of owners for the nominee accounts. These data are therefore left out.

[9]To avoid problems due to low liquidity and bid ask bounce we require the stocks used in the analysis to have a price above NOK 10 (About USD 1.50) and have actual trades a minimum of 20 days during a year. This filter removes an average of 32 stocks per year. For more details about asset pricing data at the Oslo Stock Exchange see Ødegaard (2007a).

2 How well diversified are large equity owners?

We begin by describing the portfolio holdings of the largest investors in each firm. Before we look at the portfolios of the largest owners, table 1 shows some statistics for the relative size of these largest owners in a given company. Panel A of the table shows that the average largest owner has an equity stake of almost 30%, while the average second largest owner has a stake just above 10%. These numbers vary across owner types. Financial and individual owners tend to have a smaller stake than nonfinancial corporations and foreign owners of the same rank. Panel B of the table shows what fractions of the owners are of a given type. Observe that the largest owner most commonly is a nonfinancial corporation (about 50% of the sample). Financial owners seem to avoid being the largest owner, they are more commonly owners of ranks 2-5.

Table 1 Descriptive statistics for the ownership stakes of the largest investors

Panel A: What fraction of a given company is owned by the largest owners?

Rank	All	State	Financial	Nonfinancial	Foreign	Individual
1	28.7	34.8	18.3	30.6	29.3	23.2
2	10.3	9.4	8.0	11.6	10.9	9.1
3	6.4	5.7	5.4	7.2	6.4	5.9
4	4.5	4.5	4.3	4.8	4.7	4.0
5	3.5	3.7	3.5	3.6	3.6	3.1

Panel B: What fraction of the sample of owners is of a given type?

Rank	State	Financial	Nonfinancial	Foreign	Individual
1	8.5	10.8	49.6	22.5	8.7
2	7.2	18.6	39.3	24.5	10.5
3	5.4	23.2	35.3	24.4	11.6
4	4.5	26.4	31.2	24.6	13.3
5	4.2	27.2	29.1	25.4	14.1

The tables describe the ownership stakes in individual companies for all owners. We report the actual stake in one company, without controlling for the complete portfolio of the owner. Panel A shows the fraction of a given company held by the owners of ranks 1-5. The calculation is done for all owners (all) and splitting the owners into five groups: State, financials, nonfinancial corporations, international (foreign) owners and individual (private) owners. Panel B calculates what percentage of the sample of owners is of each of the four types. Numbers in percent. Data for companies listed at the Oslo Stock Exchange in the period 1989 to 2006.

We now turn to the actual portfolios of the largest owners, and ask how well diversified they are. We calculate two simple measures of diversification. The first calculates the number of stocks in a portfolio, which assumes that diversification increases in the number of different components in a portfolio. The second looks at the concentration of wealth in the largest stock position in a portfolio.

2.1 How many stocks do the largest owners invest in?

We first ask simply how many stocks an investor holds in his portfolio. For each firm and date in the sample we find the five largest owners. For each owner we identify the owner's actual portfolio of listed stocks at the Oslo Stock Exchange and count the number of listed firms in the portfolio. Table 2 shows the results, split by the owner's rank. We show averages calculated for all owners, and also split by the four owner types financial, foreign, individual and nonfinancial (corporate) owners.

A number of interesting patterns appear in the table. First, the mean is substantially above

Table 2 The number of stocks in the equity portfolios of the largest owners

| rank | All | | | Financial | | | Foreign | | | Individual | | | Nonfinancial | | |
	mean	med	n	mean	med	n	mean	med	n	mean	med	n	mean	med	n
1	17.7	4	3026	49.0	34	382	29.8	3	710	6.0	3	272	7.3	3	1662
2	27.2	11	3034	51.1	41	651	41.2	25	778	9.0	3	305	11.0	5	1300
3	29.1	13	3075	54.1	44	804	40.1	26	752	7.4	3	359	11.5	6	1160
4	32.9	18	3084	56.3	46	894	44.9	35	812	7.7	3	424	11.9	6	954
5	33.4	20	3115	55.9	46	938	43.1	28	825	11.8	5	422	12.0	6	930

The table shows descriptive statistics for the number of different stocks held by the firm's largest owners. For each company we identify the five largest owners. For each of these owners we find the number of listed firms this owner has in his portfolio. We report averages (mean) and medians (med) for each rank (1-5) for all owners and across the four owner types: Financials, nonfinancial corporations, international (foreign) owners and individual (private) owners. The column labeled n contains the number of observations. Data for companies listed at the Oslo Stock Exchange in the period 1989 to 2006.

the median across all observations. This is due to a skewed distribution. For example, there are some financial investors which essentially holds all the stocks on the exchange (one portfolio contains 193 stocks!). Such numbers significantly affect the means. In this case the median is a better indication of the midpoint of the distribution, and we therefore concentrate on the median. Over the period the median owner of rank 1 invests in only four stocks.

An obvious way to put this number in perspective is to refer to the classical analysis of Evans and Archer (1968) and Wagner and Lau (1971). These authors carry out simulations which illustrate how increasing the number of stocks in an equally weighted portfolio lowers the standard deviation of the portfolio. They argue that most of the diversification benefit has been reaped after including 10-15 shares in a portfolio.[10] However, these results are for equally weighted portfolios, not portfolios with wealth concentrated in one or a few stocks. With this in mind 4 stocks seem on the low side for a well-diversified portfolio.

The number of stocks in the portfolio increases as we move away from the largest owner. The typical owner of rank 2 has 11 stocks in his portfolio, a number which increases to 20 stocks for the fifth largest owner. This suggests that the largest owner of a firm is particularly under-diversified, an observation which will be confirmed when we look at portfolio weights.

To see whether these patterns depend on the type of owner table 2 also splits the data by the four owner groups. We see clear differences between owner types, differences which are as expected. In terms of number of stocks in the portfolio, the most diversified are financial and foreign owners, the least diversified are nonfinancial corporate owners and in particular individual owners. Individual owners are clearly least diversified, with a median of 3 stocks in the portfolio of an individual owner when (s)he is largest. It is interesting to note that also when an individual owner is not the largest, but has rank between 2 and 5, his portfolio has few stocks, ranging between 3 and 5 stocks. This pattern is different from foreign and nonfinancials, where it is only the case where such an owner is largest (rank 1) that the number of stocks is low. For example, for foreign owners, when a foreign owner has rank 1 his portfolio contains a median of 3 stocks. If instead the foreign owner is of rank 2, his portfolio has a median of 25 stocks.

To further illustrate the differences across owner types, figure 1 shows histograms giving the full distribution of the number of stocks in the largest owner's equity portfolio. The difference between financial owners and the other three owner types are particularly clearly seen in this

---

[10]Similar analysis for Norway in Ødegaard (2007a) shows that the same numbers are relevant for the Norwegian market, with most of the diversification benefit achieved after including 15 stocks in the portfolio.

Figure 1 The distribution of the number of stocks in the largest owner's portfolio

Financial owners

Individual owners

Foreign owners

Nonfinancial owners
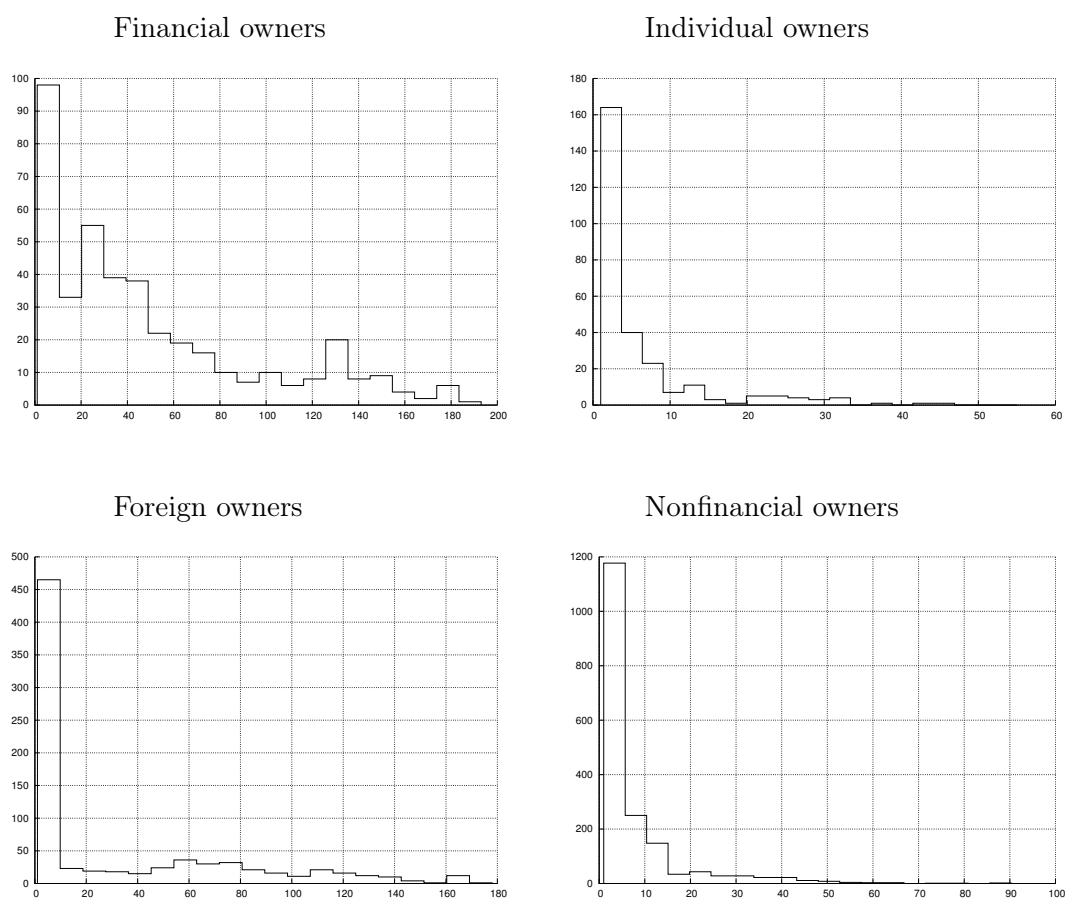
Histograms of the number of stocks in an owner's portfolio. We only use data for the largest owner in any one company. We show results for the four owner types: Financials, nonfinancial corporations, international (foreign) owners and individual (private) owners. Data for companies listed at the Oslo Stock Exchange in the period 1989 to 2006.

figure. It is only the financial owners which have a substantial number of cases where portfolios contain more than 20 stocks. For all the other owner types the leftmost bin, the one with the fewest possible number of stocks, dominates the other bins.

While the numbers of stock in a portfolio is an obvious measure of the diversification of the portfolio, it is an imperfect measure since it does not control for differences in weights across stocks in the portfolio. If we just count stocks, a portfolio with 0.95 million invested in one stock and 50 thousand spread across four other stocks is just as diversified as a portfolio with 200 thousand invested in each of the same five stocks. We therefore complement this diversification measure with one which also account for the levels of investment.

2.2 What fraction of their wealth do the largest owners need to use?

To calculate our second measure of diversification we ask: For a given firm and owner, what fraction of the owner's equity wealth is invested in that particular stock? For the example just mentioned, this measure would be calculated as 0.95 for the first case and 0.2 for the second case. Table 3 reports estimates of this diversification measure. The numbers confirm the results on the number of shares in the equity portfolios. The median largest owner has 88% of his wealth invested in the firm in which he is largest. Again, the numbers vary across owner type. The median largest financial owner only invests 9% of its portfolio wealth. In all other cases the median largest owner invests the majority of his wealth in the firm in which he is largest. The numbers vary from 61% for foreign and 95% for nonfinancial corporate to 100% for individual owners. These numbers also make the distinction between individual owners and other owners much clearer. When individual owners are of ranks 2-5 they still invest the majority of their wealth in one firm, moving from 98% for rank 2 to 86% for rank 5. For all other owner types the fraction invested falls markedly once they are not the highest ranked owner.

Table 3 The fraction of the firm's largest owner's wealth invested in the firm's equity

rank		All			Financial			Foreign			Individual			Nonfinancial	
	mean	med	n	mean	med	n	mean	med	n	mean	med	n	mean	med	n
1	0.65	0.88	2778	0.28	0.09	353	0.55	0.61	623	0.85	1.00	255	0.74	0.95	1547
2	0.45	0.27	2773	0.13	0.03	608	0.42	0.19	689	0.78	0.98	263	0.56	0.65	1213
3	0.40	0.18	2829	0.10	0.02	750	0.36	0.12	687	0.78	0.99	314	0.53	0.47	1078
4	0.36	0.11	2833	0.07	0.02	836	0.30	0.08	731	0.74	0.94	374	0.51	0.48	892
5	0.34	0.09	2832	0.08	0.02	848	0.29	0.07	744	0.69	0.86	367	0.49	0.41	873

The table shows descriptive statistics for the fraction of an owner's equity wealth invested in a firm. For each company we identify the owner according to rank and type and calculate what fraction this owner's position is of his total equity wealth. We report mean and median (med). The column labeled n contains the number of observations. Data for companies listed at the Oslo Stock Exchange in the period 1989 to 2006.

To further investigate differences across owner types figure 2 shows histograms of the full distribution of the fraction of wealth invested. The individual owners have particularly wealth concentrated portfolios. A clear majority of the nonfinancial (corporate) owners also have concentrated portfolios, but the opposite picture is true for foreign and nonfinancial investors.

The observations of this section are easily summarized. The largest owners of a firm have very undiversified equity portfolios. The median largest owner has only 4 firms in his equity portfolio, and 88% of his wealth invested in the firm in which he is largest. The diversification increases substantially once the owner is of lower rank than the first, except for individual owners. The results can be explained if owners are wealth constrained, since the wealth necessary to build up a large stake leave less funds available for other investments for diversification purposes.

Figure 2 The distribution of the fraction wealth invested, split on investor type

Financial owners

Individual owners

Foreign owners

Nonfinancial owners
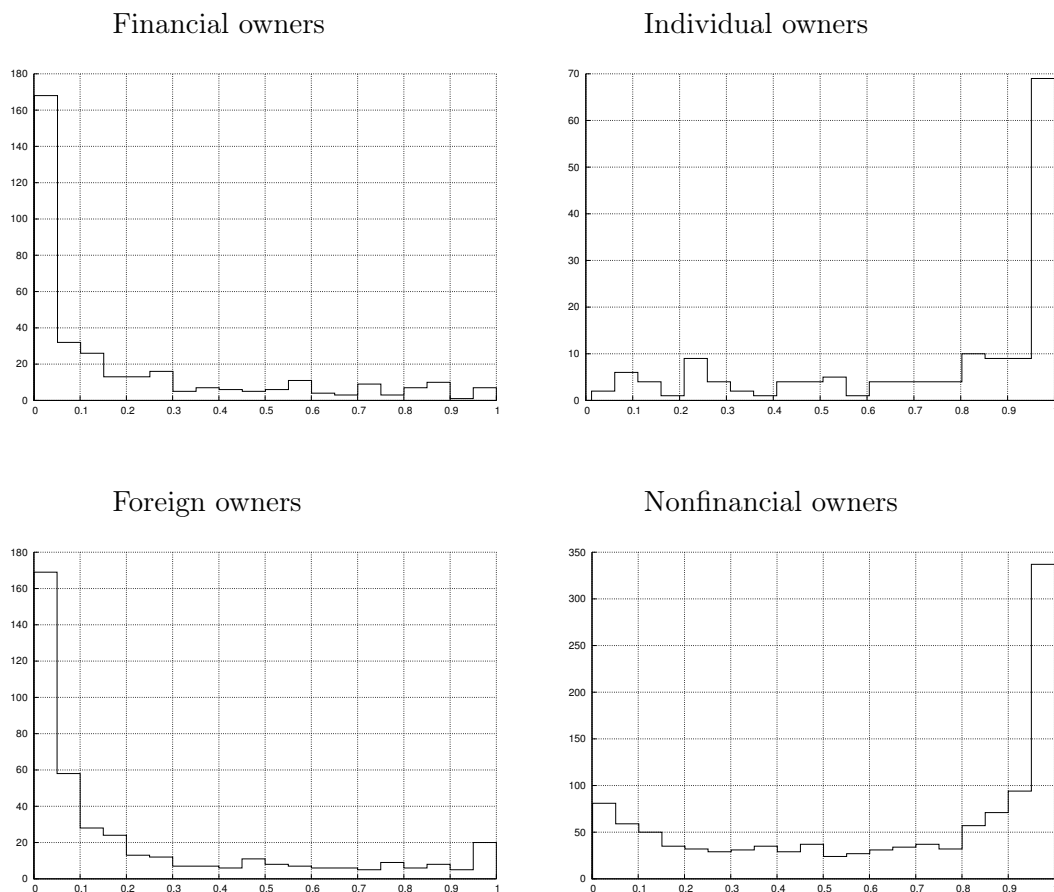
Histograms of the fraction of his equity wealth the largest owner use in the stock.. For each company we identify the largest owner and calculate what fraction this owner's position is of his total equity wealth. We only use data for the largest owners in any one company. We use annual observations of the fractions of portfolio wealth. We show results for the four owner types: Financials, nonfinancial corporations, international (foreign) owners and individual (private) owners. Data for companies listed at the Oslo Stock Exchange in the period 1989 to 2006.

This problem is most acute for individual owners, but also important for nonfinancial, corporate owners. Financial and to some degree foreign investors appear to have less of this problem.

3 Diversification losses in portfolios of financial assets

While the portfolios of the large owners are under-diversified, this does not necessarily translate into it being an economically important effect. We therefore attempt to measure the economic importance of the under-diversification, by constructing an economic measure of the diversification loss from being less than optimally diversified. We frame the question of measurement of diversification loss in a mean variance setting. The loss is found by comparing the return of a portfolio using the investor's actual mix of risky assets to the return of an alternative diversified benchmark portfolio.

Figure 3 Illustrating the method for calculating the diversification loss
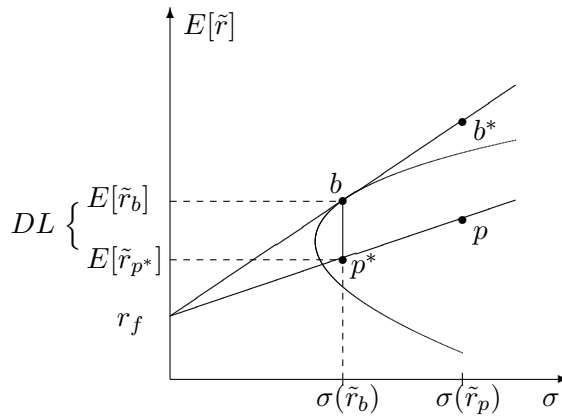
The figure illustrates our method for estimation of diversification loss. The portfolio p is the actual portfolio of an equity investor. The portfolio b is a benchmark portfolio with associated expected returns $E[\tilde{r}_b]$ and standard deviation $\sigma(\tilde{r}_b)$. The line from the risk free rate r_f through b is the set of mean variance combinations achievable by combining risk free borrowing and lending at the rate r_f with investment in the portfolio b. The nonlinear curve is the set of minimum variance portfolios of risky assets. The line from the risk free rate r_f through p is the set of mean variance combinations achievable by combining risk free borrowing and lending at the rate r_f with investment in the portfolio p. The portfolio p^* is the portfolio with the same standard deviation as b but found by combining portfolio p with the risk free asset. The portfolio b^* is the portfolio with the same standard deviation as p but with the highest achievable expected return for the same level of standard deviation.

Our measure of diversification loss is illustrated in figure 3. Suppose an investor has an actual portfolio p. This portfolio is to be evaluated relative to some well-diversified benchmark portfolio b, which can be the market portfolio, but also potentially some other well-diversified portfolio. By combining the portfolios p and b with risk free investing and borrowing, any combination along the two lines in the figure is achievable. To frame the measurement in an economically meaningful way we compare the returns of two portfolios, one optimally diversified (generated by the benchmark portfolio b), and one with the same diversification properties as the investor's actual portfolio, i.e. along the line generated by p. We measure the diversification loss by the vertical difference in expected returns between the two portfolios. As a conservative estimate we measure the difference at the same level of risk as the benchmark portfolio b, the vertical difference between the returns on portfolios b and p^* in the figure. This comparison assumes that the investor has a risk free investment together with his investment in p. Our measure of

9

the diversification loss is thus the difference in expected returns for the two portfolios b and p^*,[11]

$$\text{Diversification loss} = DL = E[\tilde{r}_b] - E[\tilde{r}_{p^*}].\tag{1}$$

To estimate this loss, note that it can also be calculated as

$$\text{Diversification loss} = DL = [SR(\tilde{r}_b) - SR(\tilde{r}_p)]\,\sigma(\tilde{r}_b),\tag{2}$$

where SR is the Sharpe Ratio. To do estimation we find the actual portfolio of an owner at a given date. We then estimate the Sharpe ratio of the portfolio from the monthly buy and hold returns of this portfolio over the next four years.[12] Using data from the matching time period we also estimate the Sharpe ratio of the reference portfolio b. We then use equation (2) to estimate the diversification loss DL.

As was shown in the previous section, the largest owner was specially under-diversified. We therefore do the calculation for only the largest owner. Table 4 shows estimates of the diversification loss against four different benchmark portfolios. The first two benchmarks are market indices, one value weighted (VW) and one equally weighted (EW).

Table 4 Estimates of the diversification loss

Reference portfolio	All		Individual		Financial		Foreign		Nonfinancial	
	mean	n	mean	n	mean	n	mean	n	mean	n
EW	0.87	2216	0.85	200	0.80	346	0.86	420	0.89	1250
	(40.6)		(12.0)		(19.2)		(16.9)		(30.0)	
VW	1.08	2216	1.15	200	1.05	346	1.06	420	1.09	1250
	(46.2)		(16.1)		(19.7)		(20.7)		(33.1)	
EW20	0.53	2216	0.51	200	0.52	346	0.47	420	0.56	1250
	(18.1)		(5.4)		(8.0)		(8.1)		(13.3)	
VW20	1.58	2216	1.75	200	1.53	346	1.51	420	1.59	1250
	(35.4)		(12.0)		(14.5)		(18.3)		(24.9)	

For each company we find the largest owner in the company, and calculate the actual portfolio p of a given owner at yearend. We then assume this portfolio is held for four more years, and calculate the diversification loss relative to a reference portfolio b as $DL = [SR(r_b) - SR(r_p)]\,\sigma(r_b)$. The calculation is done for all nongovernment owners (all), individual, financial, foreign and nonfinancial corporate owners. This calculation uses four different benchmark portfolios: VW – a value weighted market index, EW – an equally weighted market index, EW20 – an equally weighted portfolio of the 20 largest stocks at the OSE and VW20 – a value weighted portfolio of the 20 largest stocks. The indices are described in Ødegaard (2007a). The numbers are monthly percentage returns. Numbers in parenthesis are t-ratios.

As was to be expected, given our earlier estimates of the concentration of the largest owner, with an average of 65% and a median of 88% of his equity investment in one stock, we find economically large estimates of the diversification loss. Using the market portfolio VW as a benchmark, on average for all owners, the diversification loss DL is estimated at 1.08% per month. It is also highly statistically significant. Thus, if the typical investor were to divest his (undiversified) portfolio generated by p^* and invest in the benchmark b, he would gain an additional expected return of almost 13% per annum.

---

[11]An alternative would have been to look at the difference between the actual portfolio p and the efficient portfolio with the same standard deviation as p, marked as the portfolio b^* in the figure. A problem with this is that it assumes using risk free borrowing to lever up an investment in the benchmark portfolio b, which may not be an implementable strategy for the investors in question. We will therefore stick to the more conservative estimate represented by p^*.

[12]While this buy and hold strategy may seem unrealistic, it tallies with evidence in Bøhren, Priestley, and Ødegaard (2006) which shows that the average holding period for the largest owner in the same sample of firms is between three and four years.

As was also to be expected, the diversification loss is largest for individual owners, with an estimated DL of 1.15% per month, which is about 13.5% in annual terms. Also as expected, the lowest diversification loss is for financial owners. It is actually somewhat surprising that the estimated diversification loss for financials is as high as it is, given that most financial owners are very diversified. However, while the financial owners are more diversified than the others, as shown in figure 1, there is still a distribution where some of them have a low number of stocks in their portfolios. (A quarter of the financial owners have portfolios with less than 14 shares.) Therefore, even for the financial owners, there are gains from moving from their actual portfolios to the benchmark portfolio. There is a qualification to be made here, though. Financial owners (like foreign) are more likely to have stocks from other countries than Norway, data which is not in our database. Their underdiversification may therefore be overstated by the analysis.

The estimates of diversification loss using the market portfolio as a benchmark are substantial. A possible reason that the estimated diversification loss is so large is that it compares an undiversified portfolio to the most fully diversified portfolio available, a market portfolio. Actually implementing an investment in the market portfolio can be difficult and costly, although one can use index funds or futures contracts to get a return close to the market index return. To gauge the sensitivity of our conclusions to the use of a market portfolio as the benchmark, we also consider two alternative benchmark portfolios containing the 20 largest companies on the exchange, one equally weighted (EW20) and one value weighted (VW20). These portfolios are much closer to being implementable alternative investments.[13] Table 4 also shows the results using these portfolios as benchmarks. In both cases the diversification loss is signifiantly positive, at 0.53% and 1.58%. The variation across owner types is similar to before, the highest diversification loss is for individual owners, the lowest for financial owners.

Our conclusion from these results is that the largest owners of a given firm have substantial costs due to their lack of portfolio diversification. Although the magnitude of the costs naturally depend on the choice of benchmark, our results indicate that the largest owners of a corporation could achieve a significant return gain at no cost in standard deviation terms by moving to a more diversified portfolio.

4 The decision problem of individual investors

We have seen that the potential gains to diversification for large, concentrated owners seem substantial. The obvious question then is why they do not diversify. Why keep these concentrated stakes? In the rest of the paper we will investigate this in the context of the decision problem of individual investors. We ask whether their observed portfolios are explainable as outcomes of a rational decision process where the individuals balance the observed diversification losses for their financial portfolio with benefits of concentration. The typical term for these benefits are private benefits.

We will proceed in the following manner. First we adjust the calculations in the previous section for the fact that these are only for the financial part of an owner's portfolio. The decision problem for an individual is necessarily based on this individuals total portfolio. It is in this context we have to compare the estimated diversification losses to potential benefits. We therefore transform our estimates for diversification losses of the financial part of the portfolio into corresponding estimates for the total portfolio. Unfortunately some of the components of the total portfolio are not observable. We therefore parametrize these components, and show effects on the total portfolio as we change them. After getting some handle on the structure of the total diversification loss we can ask whether it can be explained by estimates of private

---

[13]See Ødegaard (2007a) for definitions of these market indices.

benefits in the literature.

4.1 Total portfolio view

We looked at the diversification loss of the financial portfolios of investors of different types. Let us concentrate on private, individual owners, for whom we have a better understanding of what is involved in their decision problem, to try to get at the economically interesting issue in this paper, how does the diversification loss enter into the decision to become a concentrated owner? For a private individual we can split income into financial income, and income from other sources, such as labour. If we stay in the mean variance framework, the way to think of this is to reinterpret the diversification loss illustrated in figure 3 in terms of what we can call *total return*, the return on both financial and nonfinancial assets.

If we let r^{fin} be the return on financial assets, and r^{nonfin} the return on nonfinancial assets, such as labour income, the total return, r^{tot}, for an investor can be defined as

$$r^{tot} = \omega^{fin} r^{fin} + (1 - \omega^{fin}) r^{nonfin},$$

where ω^{fin} is the weight of financial assets in the total portfolio. If we assume the investor has mean variance preferences relative to this total portfolio, we merely have to reinterpret the portfolios in figure 3 in terms of total return, and let r_p be the return of the investor's total portfolio, let us call this r_p^{tot}, and r_b the return of a benchmark with the same composition of financial and nonfinancial assets, which we term r_b^{tot}.

To analyze this portfolio we need to evaluate its expected return and variance. In addition to the earlier characterization of the financial portfolio which gave estimates of what we will now term $E[r^{fin}]$ and $\mathrm{var}(r^{fin})$, we additionally need to specify

- $\omega^{fin}-$ the fraction of income coming from financial assets,

- $E[r^{nonfin}]-$ the expected return on nonfinancial income,

- $\sigma^2(r^{nonfin})-$ the variability of nonfinancial income, and

- $\mathrm{cov}(r^{nonfin}, r^{fin})-$ the covariability between financial and nonfinancial assets

Given estimates of these we can calculate the mean and variance of the investor's total return as in equations (3) and (4):

$$E\left[r^{tot}\right] = \omega^{fin} E\left[r^{fin}\right] + \left(1 - \omega^{fin}\right) E\left[r^{nonfin}\right] \tag{3}$$

$$
\begin{aligned}
\sigma^2\left(r^{tot}\right) &= \left(\omega^{fin}\right)^2 \sigma^2\left(r^{fin}\right) \\
&\quad + 2\,\omega^{fin}\left(1 - \omega^{fin}\right)\mathrm{cov}\left(r^{fin}, r^{nonfin}\right) \\
&\quad + \left(1 - \omega^{fin}\right)^2 \sigma^2\left(r^{nonfin}\right)
\end{aligned}
\tag{4}
$$

We then find the diversification loss of the total portfolio from

$$DL_p^{tot} = \left(SR\left(r_b^{tot}\right) - SR\left(r_p^{tot}\right)\right)\sigma(r_b^{tot}).$$

There are two obvious ways to proceed in getting at these numbers. One is to use other data sources to find estimates of some of these parameters, such as income variability, fraction financial wealth, and the like. While this could get us some hints as to relevant parameters, it is

problematic, as such data would need to be based on general labour data. The particular individuals we are looking at here, which have a financial wealth large enough to finance a position in some of the largest companies in Norway, are likely to have a very different mix of financial investments, labour income, and income from other nonfinancial sources, compared to the typical individual found from labour data. We therefore choose to go a second route, looking at the diversification loss parameterizing these inputs, by asking: Under reasonable parameter values for the various inputs, how low can the total diversification loss go? This is the question we need answered, because it will be used as a benchmark when we discuss the benefits to concentration.

4.2 How low can the total diversification loss go?

Let us start from the financial part of the portfolio problem. In figure 4 we have used the estimates of the previous section to illustrate the problem for individual owners. We use the estimated Sharpe Ratios to show the investment opportunities generated by two portfolios, the benchmark b, proxied by an equally weighted market portfolio, and p, the estimated average portfolio for these owners.[14] At the level of standard deviation of the market portfolio p, the diversification loss has been estimated in the neighborhood of 13% in annual terms. What we will do is to show the implication of this estimate for the total portfolio as we vary the other inputs to the total diversification loss calculation.

Figure 4 Illustrating diversification loss for family owners
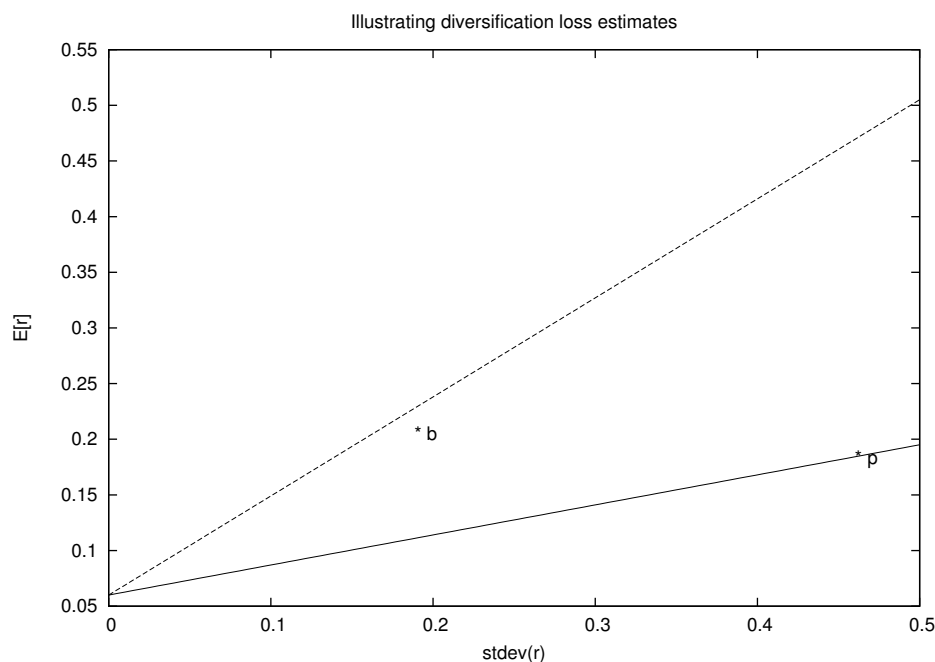
The figure illustrates calculation of diversification loss for the financial portfolios of individual(family) owners. The lines are based on the estimated Sharpe ratios, where we trace out the achievable portfolios as a function of fraction invested in the risky asset. The points p and b are plotted using separate estimates of means and variances, which explain why they are not right on the line.

---

[14]Note that there is some discrepancy between the portfolios, the Sharpe Ratios and the earlier diversification loss estimates, which is due to the way the estimation is done. In estimation of diversification loss and Sharpe ratios earlier we used actual observation of these variables for each portfolio and then took averages. In this figure we estimate means and standard deviations separately as input to the calculations. One can not expect exactly the same answer based on these averages, but it is comforting to see that we get a ballpark fit.

13

The most obvious factor affecting the total portfolio is the fraction of an individual's wealth invested in financial assets. Let us see how the total diversification loss varies with this. To illustrate we need some assumptions about the nonfinancial part of the portfolio. We start with the most extreme assumption, that the nonfinancial income is risk free, and equal to the risk free rate. In panel A of figure 5 we show the estimated total diversification loss as a function of the investor's weight in financial assets. We see that the diversification loss of course decreases toward zero as the investor lowers the weight in financial assets. However, for the individuals we consider here, which are presumably relatively wealthy, since they can afford significant stakes in these large companies, the weight on financial assets has to be much larger than zero. It is unlikely that these investors have more than half of their wealth linked to labour income and nonfinancial assets. For an investor with 50% weight in nonfinancial assets the total diversification loss is still as large as 4% in annual terms.
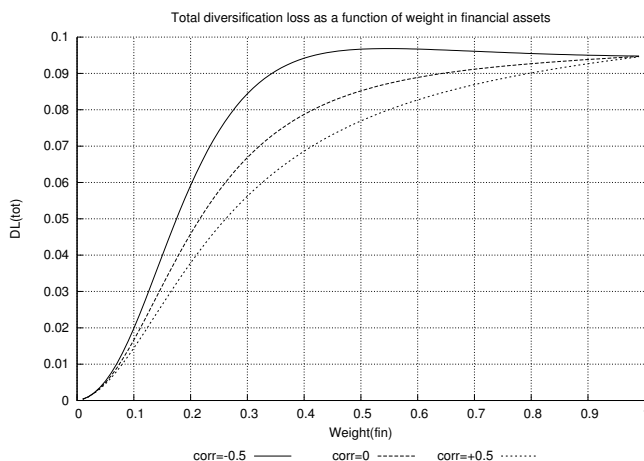
Figure 5 The total diversification loss varying fraction invested in financial assets

Panel A: Risk free nonfinancial income
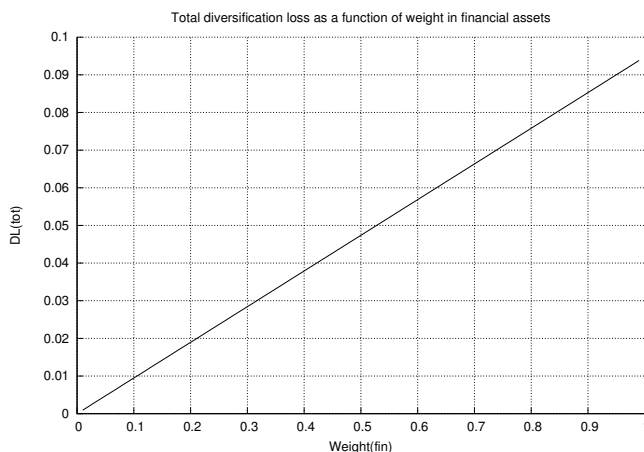
Panel B: Risky nonfinancial income

The plots show the total diversification loss (DL^{tot}) as a functions of the investor's weight in financial assets. We calculate the total diversification loss as in equations (3) and (4). The plot in panel A is produced under the assumption that nonfinancial assets are risk free and have returns equal to the risk free rate. The plot in panel B is produced under the assumption that nonfinancial assets are risky with expected returns equal to the expected returns on the benchmarks, and volatility of nonfinancial assets equal to half of the volatility of the benchmark. In the calculations we let $E[r^{nonfin}] = E[r_b]$ and $\sigma(r^{nonfin}) = \frac{1}{2}\sigma(r_b)$.

14

In generating the figure in panel A we assumed that the nonfinancial income was risk free, but this is an extreme assumption unlikely to be correct. We therefore show a similar calculation with risky nonfinancial income. In panel B of figure 5 we let the expected nonfinancial return equal that of the financial benchmark, but lower the variance of the nonfinancial income to half that of the financial benchmark. The figure shows the resulting relationships between total diversification loss and the fraction invested in financial assets. We show separately the cases of positive, zero and negative correlation between nonfinancial and financial income. The most important observation to make from the figure is that, with risky nonfinancial assets, the fraction of financial assets in the total portfolio must be pretty low before the total diversification loss is pulled significantly down from that of the financial portfolio, alone. For example, when the financial and nonfinancial assets are uncorrelated, the total diversification loss is only lowered to about 8.5% for an investor with half his wealth in financial assets. The fraction of financial assets needs to go below a quarter of total wealth before the total diversification loss is halved relative to the only financial assets case.

While the fraction financial assets is the most important factor affecting the total diversification loss calculation, let us for completeness look at the sensitivity of results to the two other variables: the return on the nonfinancial assets, and the volatility of the nonfinancial assets. Figure 6 illustrates the variation of the total diversification loss as we vary these variables. In both figures we fix the weight on the financial asset w^{fin} at a half. We see that the diversification loss of the total portfolio is actually increasing in the expected return on the nonfinancial assets. On the other hand, if the volatility of the nonfinancial asset increases, this lowers the effect of the diversification loss of the financial assets on the total portfolio, although the volatility of nonfinancial income has to be larger than the volatility of the stock market before the total diversification loss is less than 6%.

The conclusion of these calculations is that the total diversification loss *is* lowered by also considering other portfolio components. But it is unlikely to be reduced to trivial values. If we think that half of the assets in the financial part of the portfolio is a reasonable lower bound, the total diversification loss is unlikely to be more than halved, i.e. go below 6% in annual terms.

## 4.3 Balancing the cost – private benefits?

Let us now look at the question of whether the diversification loss we estimated can be justified in terms of balancing costs with benefits. We found a diversification loss of the financial portfolio of about 13% annually, which will be reduced if we change the perspective to total diversification loss, but is unlikely to be less than 6% for reasonable parameter values. We then need to ask whether extant measures of private benefits of control can be high enough to offset this diversification loss. To do so we need to find an annualized estimate of private benefits.

As mentioned, private benefits of control have been measured two ways, from block premia or voting premia. We will concentrate on the last method, as we actually have measures of these for Norway for roughly the same period, from Ødegaard (2007b). In companies with two classes of stock, one voting and one nonvoting, the price difference between the two is assumed to reflect the additional value of being able to control the firm through voting. Hence, the voting premium reflects how much an owner is willing to pay for the private benefits associated with control. While this voting premium at best is an imperfect measure of private benefits,[15] it is the most commonly cited one in the literature. We therefore ask whether estimates of benefits of control, found from estimated voting premia, are large enough to offset the diversification loss

---

[15]The voting premium may also be affected by other factors, such as stock liquidity and tax issues, which makes it more difficult to isolate the voting premium. For surveys of this large literature we refer to Burkhart and Lee (2008) and Adams and Ferreira (2008).

Figure 6 Changes in the total diversification loss when varying expectation and volatility of return on nonfinancial assets

Panel A: Varying expected return on nonfinancial income

Total diversification loss as a function of expected returns for nonfinancial assets
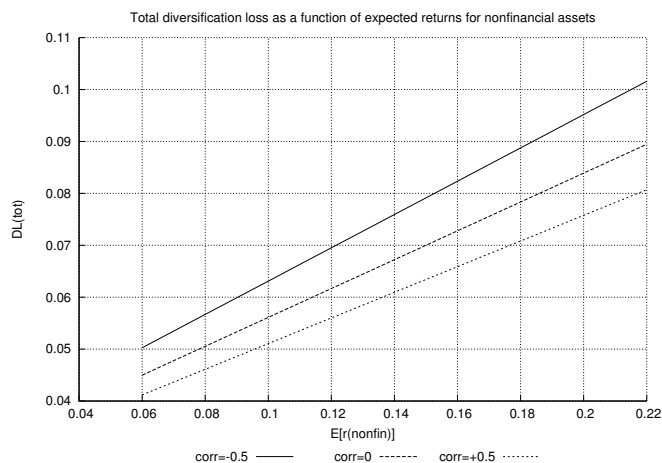
Panel B: Varying volatility of nonfinancial income

Total diversification loss as a function of volatility of returns for nonfinancial assets
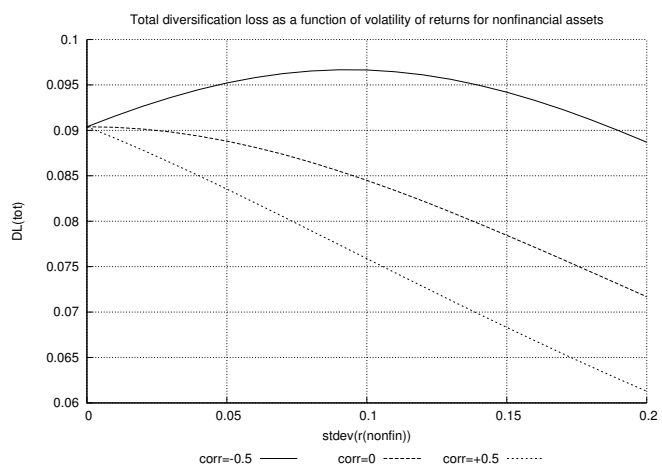
The plots shows the total diversification loss (DL^{tot}) as a function of various parameters. We calculate the total diversification loss as in equations (3) and (4). In the figures we fix the weight on the financial asset w^{fin} at a half. In the plot in panel A we change the expected return on nonfinancial assets ($E[r^{nonfin}]$) from r_f to 10% above $E[r_b^{fin}]$. In this plot the volatility of the nonfinancial assets is fixed at $\sigma(r^{nonfin}) = \frac{1}{2}\sigma(r_b)$. In the plot in panel B we change the volatility of the return on nonfinancial assets ($\sigma\left(r^{nonfin}\right)$) from 0 to 10% above $\sigma\left(r_b^{fin}\right)$. Here we let the the expected return on the nonfinancial assets equal the financial benchmark return, $E[r^{nonfin}] = E[r_b]$.

which is the focus of this paper.

We first have to make these two measures comparable. The voting premium reflects the present value of all future private benefits. Let us simplify things a bit, and assume that annual cashflows and private benefits are perpetuities. The price of a *nonvoting* stock, P_{nonv}, is then

$$P_{nonv} = \frac{E[D]}{r},$$

where $E[D]$ are the annual dividends, and r a required return reflecting the risk of the company. If we assume that the owner of a voting share receive annual private benefits PB per stock, we can write[16]

$$P_{vot} = \frac{E[D] + E[PB]}{r}.$$

Given this assumption of annual private benefits, the equivalent annual *return* coming from private benefits would be

$$R_{PB} = \frac{E[PB]}{P_{vot}}.$$

The typical estimates of voting premia (VP) are given relative to the (nonvoting) stock price. For Norway we have an estimate of

$$VP = \frac{P_{vot} - P_{nonvot}}{P_{nonvot}} = 9.7\%$$

By plugging in the relations above and rearranging we find the following expression for the annual "returns" to private benefits:

$$R_{PB} = \frac{E[PB]}{P_{vot}} = r \frac{P_{vot} - P_{nonvot}}{P_{vot}} = r \cdot 0.091.$$

Note that this relationship depends on the (company specific) interest rate (cost of capital) r. If we for example calculate this for a cost of capital as high as 20%, the implied return to private benefits is estimated at 1.82%. Since the returns to private benefits are increasing in r, one will have to work hard to match these estimates of private benefits to the numbers for losses we found earlier. One will need extreme levels of required return before the private benefits are higher than 2% in annual terms. Given out finding that the annual total diversification losses are unlikely to be lower than 6%, the literature's estimates of private benefits are thus much too low to explain the diversification losses implied in our estimates.[17] So, if we maintain the assumption of rational decision making, either our estimates of diversification losses over-estimate the true losses, or the private benefits coming from ownership concentration are larger than previously thought, or a combination of the two is true.

---

[16]In principle we could allow for discounting at a required rate of return that also reflects the risk of the private benefits, but we will for simplicity assume these have the same risk as the firm.

[17]This conclusion does of course depend on our method for finding the annualized private benefits. One may react to the assumption that we do not allow for growth in dividends and private benefits. But putting growth in would actually *lower* the estimated private benefits, the calculation would be $PB/P_{vot} = (r - g) \cdot 0.091$, which is maximized for $g = 0$. Adding growth would therefore not help.

5   Conclusion

In the title of the paper we mentioned two questions, the magnitude of the diversification costs of large, concentrated equity stakes, and whether these costs are justified. In the paper we provide answers to both questions. We show that there, as theoretically suspected, *is* a large cost to concentrated, undiversified portfolios. As far as we know, our paper is the first to actually quantify this cost. Let us take the example of individual owners, For the pure financial part of such owner's portfolios, using mean-variance analysis we showed that an owner with the same risk as the market portfolio could gain 13% of additional annual expected return by moving to an optimal portfolio. While these estimated costs would be lowered if we considered the *total* portfolio of these owners (a portfolio which also account for nonfinancial income, such as labour income), they will not be low enough to approach the estimates of annual private benefits. Thus, the answer to the second question is "no, it is not justified." The estimated diversification losses are much higher than can be explained by current estimates of private benefits.

References

Adams, R., Ferreira, D., 2008. One share – one vote: The empirical evidence. Review of Finance 12 (1), 51–91.

Admati, A. R., Pfleiderer, P., Zechner, J., 1994. Large shareholder activism, risk sharing, and financial market equilibrium. Journal of Political Economy 102, 1097–1130.

Barber, B. M., Odean, T., Apr. 2000. Trading is hazardous to your wealth: The common stock investment performance of individual investors. Journal of Finance 55 (2), 773–806.

Barclay, M. J., Holderness, C. G., 1989. Private benefits from control of public corporations. Journal of Financial Economics 25, 371–95.

Becht, M., Bolton, P., Roell, A., 2003. Corporate governance and control. In: Constantinides, G. M., Harris, M., Stulz, R. M. (Eds.), Handbook of the Economics of Finance. Vol. 21 of Handbooks in Economics. Elsevier, Ch. 1, pp. 1–109.

Blume, M., Friend, I., 1975. The asset structure of individual portfolios and some implications for utility functions. Journal of Finance 30 (2), 585–603.

Bodnaruk, A., Kandel, E., Massa, M., Simonov, A., Nov. 2008. Shareholder diversification and the decision to go public. Review of Financial Studies 21 (6), 2779–2824.

Burkhart, M., Lee, S., 2008. One share – one vote: The theory. Review of Finance 12 (1), 1–49.

Bøhren, Ø., Priestley, R., Ødegaard, B. A., Sep. 2006. Ownership duration and corporate governance, working paper, BI Norwegian School of Management.

Bøhren, Ø., Ødegaard, B. A., Sep. 2000. The ownership structure of Norwegian firms: Characteristics of an outlier, research report Nr 13/2000, Norwegian School of Management.

Bøhren, Ø., Ødegaard, B. A., 2001. Patterns of corporate ownership: Insights from a unique data set. Nordic Journal of Political Economy, 57–88.

Bøhren, Ø., Ødegaard, B. A., Feb. 2006. Governance and performance revisited. In: Ali, P., Gregouriu, G. (Eds.), International Corporate Governance after Sarbanes-Oxley. Wiley, pp. 27–64.

Demsetz, H., Lehn, K., 1985. The structure of corporate ownership: Causes and consequences. Journal of Political Economy 93, 1155–77.

Dyck, A., Zingales, L., Apr. 2004. Private benefits of control: An international comparison. Journal of Finance LIX (2), 537–600.

Evans, J. L., Archer, S. H., 1968. Diversification and the reduction of dispersion: An empirical analysis. Journal of Finance 23, 761–767.

Goetzmann, W., Kumar, A., Apr. 2005. Why do individual investors hold under diversified portfolios, Yale University Working Paper.

Gugler, K., 2001. Corporate governance and economic performance. Oxford University Press.

Holmen, M., Knopf, J. D., Peterson, S., Sep. 2003. The impact of controlling shareholder diversification on the firm, working paper, Uppsala University.

Holmen, M., Knopf, J. D., Peterson, S., Oct. 2007. Trading-off corporate control and personal diversification through capital structure and merger activity. Journal of Business Finance & Accounting 34, 1470–1495.

Kumar, A., Dec. 2005. Do the diversification choices of individual investors influence stock returns?, working paper, University of Notre Dame.

La Porta, R., Lopez-de Silanes, F., Shleifer, A., Vishny, R. W., 1998. Law and finance. Journal of Political Economy 106, 1113–1155.

Lease, R. C., McConnell, J. J., Mikkelson, W., 1983. The market value of control in publicly–traded corporations. Journal of Financial Economics 11, 439–71.

Maug, E., 1998. Large shareholders as monitors: Is there a tradeoff between liquidity and control? Journal of Finance 53, 65–98.

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

Morck, R., Shleifer, A., Vishny, R. W., 1988. Mangement ownership and market valuation: An empirical analysis. Journal of Financial Economics 20, 293–315.

Polkovichenko, V., Feb. 2002. Houshold portfolio diversification, working paper, University of Minnesota.

Tirole, J., 2006. The Theory of Corporate Finance. Princeton University Press.

Wagner, W. H., Lau, S. C., Nov/Dec 1971. The effect of diversification on risk. Financial Analysts Journal, 48–53.

Ødegaard, B. A., Jan. 2007a. Asset pricing at the Oslo Stock Exchange. A source book, manuscript, BI Norwegian School of Management.

Ødegaard, B. A., 2007b. Price differences between equity classes. Corporate control, foreign ownership or liquidity? Journal of Banking and Finance 31, 3621–3645.