Essay 5

Owner-managers equity portfolio choice^{*}

---

^{*} This essay is co-authored with Martin Holmén. A slightly revised version of the essay has been published in *Corporate Ownership and Control* 4 (2006), 37-48. The paper was presented at the European Financial Management Association 2005 conference in Milan.

1. Introduction

A central tenet of financial theory is that individuals seek portfolio diversification. However, agency costs and adverse selection costs suggest that managers should hold a large stake in the firm to avoid incentive alignment problems (Jensen and Meckling, 1976; Leland and Pyle, 1977). If managers hold a large stake in the firm, they incur costs stemming from increased risk in the form of poor portfolio diversification (Fama and Jensen, 1983). Models of managers' behavior and executive compensation frequently account for managers' exposure to idiosyncratic firm risk.¹ Contrary to these models, Ofek and Yermack (2000) empirically show that managers hedge their executive stock options by selling shares. However, we are not aware of any evidence as to whether and how managers hedge their equity ownership in the firm by strategically choosing investments outside the firm. This highlights the contribution of our study. Using information about owner-managers' equity portfolios, we examine how they invest wealth not invested in the firm.

How should owner-managers invest that part of their wealth which is not invested in the firm? On the one hand, the benefits of portfolio diversification suggest that they should choose other stocks with negative or low correlation with their own firm. Taking the investment in the firm as a constraint, the optimal strategy for any remaining wealth is probably not a combination of the risk-free asset and the market portfolio (Merton, 1971).

On the other hand, Coval and Moskowitz (1999 and 2001) and Hau (2001) suggest that investors may limit their investments to stocks on which they have superior information. It could be argued that owner-managers have superior information about firms that are in similar lines of business to their own. Since the returns from firms in similar lines of business are most likely highly correlated, this would be the contrary to portfolio diversification.

In this paper, we attempt to answer two questions: first, do owner-managers choose other equity investments, i) with negative or low correlation with their firms, ii) with negative or low correlation among themselves, and iii) that are superior to just investing remaining wealth in the market portfolio? We define the value of other equity investments as remaining wealth. Second, do owner-managers that are active in industries characterized by a high degree of asymmetric information to a larger extent invest their remaining wealth in the same industry (Merton, 1987)? We define informational technology (IT) and telecoms as industries with a high degree of asymmetric information.

---

¹ See, e.g., Fama, 1980; Fama and Jensen, 1983; Jensen, 1986; Stulz, 1990; Lambert, Larcker, and Verrecchia, 1991; Carpenter, 2000.

We investigate these issues using a unique data set, which includes the complete ownership structure of all Swedish public firms. Our sample consists of the equity holdings of 109 managers in listed Swedish firms, as of December 28, 2001.² For these equity portfolios, we estimate several risk-characteristics.

We find limited evidence that owner-managers strategically choose stocks with a low correlation. Instead, the average owner-manager would significantly reduce his exposure to idiosyncratic risk should he invest the remaining wealth in the market portfolio. This result is driven by owner-managers in high-tech industries who also choose to invest remaining wealth in IT and telecoms. However, the owner-managers would be better off should they invest their remaining wealth in a portfolio that would hedge their main investment. Finally, by comparing Sharpe ratios, we provide a casual estimate of the cost the owner-managers bear in terms of under diversification. On average, the owner-managers could have improved their Sharpe ratios by 45% should they have sold their main investment and invested in a well-diversified portfolio (see Meulbroek, 2001).

Researchers have looked at how much wealth managers and entrepreneurs invest in their own firm. Himmelberg et al. (1999) find that the higher the firm's risk, the lower the managerial ownership. They interpret this as increased firm risk raises the cost of managerial ownership in terms of reduced portfolio diversification and, therefore, managerial ownership is reduced. Heaton and Lucas (2000) report that entrepreneurs receive a large fraction of their income from risky business ventures and that this risk is un-diversifiable. Bitler et al. (2005) find that entrepreneurs concentrate a large fraction of their wealth in firm equity and that entrepreneurial ownership increases with outside wealth and decreases with firm risk. None of these studies look at how managers invest remaining wealth.

Other researchers have investigated investor behavior in general. Contrary to the standard theory, investors hold undiversified portfolios made up of a limited number of stocks (Barber and Odean, 2000; Goetzman and Kumar, 2002). Stocks also appear to be chosen based upon geographical or professional nearness to the investor (Grinblatt and Keloharju, 2001; Coval and Moskowitz, 2001; Goetzmann et al., 2003).

By focusing on owner-managers' portfolio choices, we add to the literature on investment and portfolio choices. Goetzman et al. (2003) investigate how non-financial risks in the form of un-diversifiable human capital affect portfolio choices. The owner-managers in our study also have a large capital investment in the firm.³ How investors choose to invest remaining

---

² To conform to Swedish law, the data set is made anonymous (i.e., firms' and managers' names are removed).

³ We do not analyze why they hold a large block in the firm.

wealth conditional upon a large investment in a particular firm has, to our knowledge, not been studied before. Additionally, owner-managers should have a better knowledge of standard portfolio theory than the average investor. Finally, by comparing owner-managers active within high-tech industries where informational advantages, real or perceived, could be stronger than within other industries, we shed additional light on to what extent superior information affects portfolio choices.

We also indirectly add to the literature on executive compensation. Ofek and Yermack (2000) find that managers hedge their stock options by selling shares. If managers also hedge their equity by taking an offsetting position in the stock-market, it would further negate the incentive effects of equity-based compensation.

The remainder of the paper is structured as follows. In the next section, we present our sample and how we define various portfolio characteristics. Section 3 reports our results. Section 4 summarizes and concludes.

2. Sample selection and variable definitions

In this section, we first explain how our sample is constructed and provide descriptive statistics. We then discuss how various risk-characteristics of the owner-managers' equity portfolios are estimated. Finally, we provide statistics on the industry composition of the owner-managers' portfolios.

2.1. Sample selection

The sample consists of the equity portfolios held by owner-managers (CEO or Chairman) active in firms on the Stockholm Stock Exchange (SSE), as of December 28, 2001.⁴ The source of ownership data is a unique database provided by the Swedish Securities Register Centre (VPC AB).⁵ VPC manages the share registers of all companies on the SSE or other authorized Swedish marketplaces, as well as the share registers of many non-listed Swedish companies. Admittedly, we do not know how much wealth the owner-managers have besides direct investments on the Swedish stock-market, nor how this wealth is invested. However, we argue that if the owner-managers try to reduce their exposure to idiosyncratic risk, it will

---

⁴ We also include stocks held by the owner-managers' families in the equity portfolios.

⁵ Ownership of more than 500 shares in a Swedish firm is, by law, made public each half year, at the end of June and at the end of December. In our data set, ownerships of less than 500 shares in a Swedish stock are also included. In the database, we are also able to extract: age, sex and the domicile of the owner-manager.

affect their portfolio of direct investments in Swedish equity. Choosing equity investments strategically would also be a cheap way of reducing their exposure to idiosyncratic risk.

Our sample only includes those top managers (CEO or Chairman) who are among the 25 largest shareholders in their firm. The reason for this is that we identify the managers with data provided by SIS Ownership Service (SIS Ägarservice), which provides statistics of the share ownership of the largest 25 investors for all firms listed on a Swedish stock-market in the book “Owners and Power in Sweden’s Listed Companies” (Sundin and Sundqvist, 2002).⁶ In total, we found 192 top managers that are among the 25 largest shareholders in their firm. Because some of the owner-managers own stocks indirectly through another company, we are not always able to capture all their investments in Swedish stocks and, therefore, we exclude 47 managers from the sample. In addition, eight managers are excluded from the sample because they are active as chairman in several companies or else active as both CEO and Chairman in different companies. Another 28 managers are excluded because they own stocks through a foreign deposit or are active in firms with poor equity return data.⁷ The final sample consists of equity portfolios held by 109 owner-managers (63 CEOs and 46 chairmen) active in 93 out of the 304 firms on the SSE in December 2001. There are 370 different firms in the equity portfolios held by the owner-managers in our sample and 288 of those firms are listed on a stock exchange in Sweden. The security prices of the listed firms are provided by SIX AB. If a firm has stocks with different voting rights and only one type of the stock is traded, we proxy the stock return of the non-traded stock with the return of the traded stock.⁸ If a firm has several listed stocks, we use returns data for the most traded stock.

In Table 1 Panel A, we report the age of the owner-managers, statistics about the owner-managers’ investments in their own firms, and the risk characteristics of these firms. The average age of the owner-managers is 51 years, with a median of 52 years. CEOs are relatively younger, with an average age of 49 years compared to the chairmen in the sample, who have an average age of 57 years (not reported in the Table). There are only two equity portfolios held by females in our sample, so essentially all the owner-managers in the sample are male (98%).

---

⁶ Swedish companies domiciled abroad are not included.

⁷ Owner-managers active in companies with shares traded less than three months during 2001 are also removed from the sample.

⁸ Swedish firms often issue two types of shares (A and B) with equal cash flow rights but different voting rights. Typically, A-shares are one-share-one-vote while B-shares carry 1/10 vote per share.

Table 1**Descriptive Statistics**

This table presents the characteristics of the owner-managers' firms and equity portfolios. The sample used in this study consists of the equity portfolios held by 109 owner-managers (CEO or Chairman) active in Swedish firms as of December 28, 2001. *Owner-manager's age* is the age of the owner-manager as of December 28, 2001. *Market cap firm* is the market capitalization value in million SEK of the owner-manager's firm as of December 28, 2001. *Value of manager's investment in firm* is the value in million SEK of the owner-manager's investment in the firm as of December 28, 2001. *Value of manager's portfolio* is the value in million SEK of the owner-manager's total portfolio of Swedish stocks. *Fraction firm in portfolio* is defined as *Value of manager's investment in firm* divided by *Value of manager's portfolio*. *Capital fraction* is the owner-manager's fraction of the firm's equity capital. *Vote fraction* is the owner-manager's fraction of the firm's voting rights. *Beta firm* is the equity Beta of the owner-manager's firm. *Std Dev firm* is the annualized standard deviation of the stock return of the owner-manager's firm. *Variance firm* is the annualized variance of the stock return of the owner-manager's firm. *Beta firm*, *Std Dev firm* and *Variance firm* are estimated on weekly data during 2001 (52 observations). The market portfolio is approximated by AFGX. *Market Risk firm* is defined as *Beta firm* squared times the variance of the market portfolio. *Idiosyncratic risk firm* is defined as *Variance firm* - *Market risk firm*. *Number of firms* is the number of Swedish firms in the owner-manager's portfolio of Swedish equity. *Number of non-listed firms* is the number of non-listed firms in the owner-manager's portfolio of Swedish equity. *Beta portfolio* is the equity Beta of the owner-manager's portfolio. *Std Dev portfolio* is the annualized standard deviation of the return in the owner-manager's portfolio. *Variance portfolio* is the annualized variance of the return in the owner-manager's portfolio. *Market risk portfolio* is defined as *Beta portfolio* squared times the variance of the market portfolio. *Idiosyncratic risk portfolio* is defined as *Variance portfolio* - *Market risk portfolio*.

Panel A: Risk and ownership characteristics of the owner-managers' firms

	Mean	Min	Median	Max	Std Dev
<i>Owner-manager's age</i>	51	34	52	77	9
<i>Market cap firm</i>	2,806	9	377	158,483	15,853
<i>Value of manager's investment in firm</i>	664	0.050	16	61,513	5,901
<i>Fraction firm in portfolio</i>	0.788	0.007	0.939	1	0.289
<i>Capital fraction</i>	0.110	0.001	0.053	0.609	0.135
<i>Vote fraction</i>	0.176	0.001	0.080	0.906	0.222
<i>Beta firm</i>	1.080	-0.026	0.949	2.883	0.773
<i>Std Dev firm</i>	0.679	0.163	0.643	1.622	0.339
<i>Variance firm</i>	0.575	0.027	0.413	2.632	0.553
<i>Market risk firm</i>	0.123	0.001	0.065	0.600	0.139
<i>Idiosyncratic risk firm</i>	0.452	0.021	0.309	2.353	0.469

Panel B: Characteristics of the owner-managers' equity portfolios

	Mean	Min	Median	Max	Std Dev
<i>Value of manager's portfolio</i>	683	0.371	22	61,827	5,932
<i>Number of firms</i>	11	1	6	83	14
<i>Number of non-listed firms</i>	1	0	0	7	1.334
<i>Beta portfolio</i>	1.062	-0.006	0.946	2.683	0.628
<i>Std Dev portfolio</i>	0.579	0.163	0.525	1.465	0.281
<i>Variance portfolio</i>	0.414	0.027	0.275	2.148	0.375
<i>Market risk portfolio</i>	0.109	0	0.065	0.519	0.116
<i>Idiosyncratic risk portfolio</i>	0.304	0.013	0.174	1.671	0.303

The average owner-manager in our sample has 78.8% of his direct investment in Swedish stocks invested his own firm. On average (median), the owner-managers hold 11% (5.3%) of the cash flow rights and 17.6% (8%) of the voting rights in their own firms. The average

market capitalization of the owner-managers' firms is smaller than the average firm on the SSE (2,806 million SEK vs. 9,363 million SEK). The average systematic risk measured as the Beta of the companies the owner-managers' firms are close to 1, with an average Beta of 1.08 and a median Beta of 0.949.⁹ The average (median) total risk of these firms measured as annualized standard deviation is 67.9% (64.3%).

2.2. Risk characteristics of owner-managers' portfolios

Table 1 Panel B presents the number of firms in the owner-managers' equity portfolios and the risk characteristics of those portfolios. The average (median) number of firms in the owner-managers' equity portfolios is 11 (6). When calculating the value and risk characteristics of the owner-managers' portfolios, non-listed firms are not considered since the market values and historical returns data is lacking for these firms.¹⁰ The risk characteristics of the equity portfolios held by the owner-managers are calculated using the weekly equity return data for 2001. Because some stocks were only traded for a short period in 2001 and some stocks were very illiquid, the risk characteristics are only estimated for 255 out of the 288 listed firms held by the owner-managers. The average Beta of the owner-managers portfolios is 1.062 (median 0.946), and the average total risk measured by annualized standard deviation is 57.9% (median 52.5%). The fraction of idiosyncratic risk in relation to total risk measured as variance is on average 73.4% (median 63.3%). The high degree of idiosyncratic risk in the portfolios indicates that much of the total risk in the portfolios could be reduced with a higher degree of diversification.

Table 2 Panel A provides statistics on the most widely held stocks among the owner-managers in our sample. It appears as if Swedish owner-managers roughly invest in the same stocks as the general investor. The most common Swedish stocks among all shareholders (rank number of shareholders) are also the most common stocks among the owner-managers in our sample. One exception is Föreningssparbanken, which is the third most common stock ranked on number of shareholders (the tenth largest stock according to market capitalization) in general, but not one of the 18 most popular stocks among our sample of owner-managers. Another bank, Nordea, was the third largest Swedish stock ranked on market capitalization, but not one of the 18 most popular stocks in our sample.

---

⁹ Beta and standard deviation are estimated with weekly equity return data during 2001. Affärsvärldens General Index (AFGX) is used as a proxy for the market portfolio.

¹⁰ This shouldn't be a major issue since, on average, only one out of the average 11 firms in the portfolios is a non-listed firm (the median is zero firms).

Table 2**Most widely held stocks and industries among owner-managers**

In this table we provide statistics on the most widely held stocks and industry sectors in the owner-managers' equity portfolios. The sample used in this study consists of the equity portfolios held by 109 owner-managers (CEO or Chairman) active in Swedish firms as of December 28, 2001. In total, the 109 owner-managers have invested in 370 different Swedish firms. In this table, we report the 18 firms in which more than 10% of the owner-managers have invested. The firms are ranked according to market capitalization on the SSE and number of shareholders.

Panel A: Most widely held stocks

Firm	Industry Sector	Percentage of sample	Market Cap **	Rank Market Cap	Rank number of shareholders	Equity Beta	Std Dev
Ericsson	IT	39	461	1	2	2.25	0.69
Telia	Telecoms	21	140	4	1	0.61	0.39
Skandia	Financials	20	78	7	9	2.02	0.64
SEB	Financials	18	67	11	4	1.01	0.47
H & M	Consumer Discretionary	17	180	2	7	0.99	0.51
Tele2	Telecoms	17	54	15	20	1.55	0.54
Volvo	Industrials	15	77	8	5	0.76	0.33
Electrolux	Consumer Discretionary	14	57	14	21	1.21	0.47
Sandvik	Industrials	14	58	13	22	0.93	0.36
Skanska	Industrials	14	26	23	18	0.71	0.44
Billerud*	Materials	13	4	62	6	-	-
Scania	Industrials	13	38	19	26	0.54	0.28
Gambro	Health Care	12	23	26	15	0.36	0.31
Investor	Financials	12	88	6	8	0.77	0.31
SCA	Materials	11	67	12	19	0.57	0.28
Atlas Copco	Industrials	10	49	18	28	1.12	0.42
SSAB	Materials	10	10	40	34	0.71	0.36
SHB	Financials	10	110	5	12	0.42	0.23

* Billerud was listed at the end of November 2001; therefore, reliable estimates of Equity Beta and Standard Deviation are not available for December 28, 2001.

** Billion SEK.

Panel B: Industry sectors in which the owner-managers' firms are active

Industry Sector	Percentage of sample	Frequency
IT	47	51
Industrials	24	26
Consumer Discretionary	10	11
Financials	10	11
Health Care	4	5
Materials	3	3
Telecoms	2	2
	100	109

Table 2 Panel B reports the industry sectors in which the owner-managers' firms are active. Almost half of the owner-managers' firms are active in the IT (47%) and telecoms

(2%) sectors. The other classified industry sectors are industrials (24%), consumer discretionary (10%), financials (10%), healthcare (4%) and materials (3%).

2.3. Industry concentration of portfolios

Table 3 presents industry composition and statistics on the degree of industry concentration in the owner-managers' equity portfolios. All the listed firms held by the owner-managers are categorized as belonging to one of ten industry sectors according to the Global Industry Classification System (GICS) provided by Morgan Stanley Capital International and Standard & Poor's.

Table 3

Industry concentration of portfolios

In this table, we provide statistics on owner-managers' portfolio composition in terms of different industries. The sample used in this study consists of the equity portfolios held by 109 owner-managers (CEO or Chairman) active in Swedish firms as of December 28, 2001. Industries are defined according to the Global Industry Classification Standard (GICS). *Main sector of total portfolio* is the fraction of the total portfolio that is invested in the same sector as the owner-manager's firm report as its main sector. *Main sector of remaining portfolio* is the fraction of the remaining portfolio - i.e., wealth not invested in the firm - that is invested in the same sector as the owner-manager's firm report as its main sector. *Herfindahl total portfolio* is the HI estimated on the industry composition of the total portfolio. *Herfindahl remaining portfolio* is the HI estimated on the industry composition of the remaining portfolio.

	Mean	Min	Median	Max	Std Dev
<i>Main sector of total portfolio</i>	0.852	0.077	0.973	1.000	0.223
<i>Main sector of remaining portfolio</i>	0.315	0.000	0.206	1.000	0.343
<i>Herfindahl total portfolio</i>	0.821	0.193	0.948	1.000	0.222
<i>Herfindahl remaining portfolio</i>	0.580	0.182	0.529	1.000	0.306

We use the Herfindahl Index (HI) as a measure of the industry concentration in the owner-managers' equity portfolios.¹¹ The HI of equity portfolio j is defined as the sum of the squared value weights of each industry i in the equity portfolio:

$$HI_j = \sum_{i=1}^N w_{i,j}^2, \frac{1}{N} \leq HI_j \leq 1 \quad (1)$$

The HI is constrained between a maximum of 1, when the equity portfolio consists of stocks in only one industry sector, and a minimum of 0.1, when the equity portfolio consists of an equal value in each of the ten industry sectors.

¹¹ The Herfindahl Index is a popular measure of concentration in economics and is also used by the Department of Justice in the US to determine whether mergers are equitable to society.

The median equity portfolio among the owner-managers has a very high proportion of investments in a few industry sectors, since the HI is close to 1 (0.948). Even if we exclude the owner-managers' investments in their own firms, the HI for the median equity portfolio is high (0.529).

3. Empirical results

In this section, we first report results on how owner-managers choose to invest remaining wealth given a large investment in their own firm. We then investigate whether the owner-managers would have been better off had they invested their remaining wealth in the market portfolio. Finally, we explore whether owner-managers in high-tech industries try to use their superior industry-specific knowledge by investing their remaining wealth in the IT and telecoms sectors.

3.1. Correlation between the firm and other investments

In Table 4 Panel A, we report the correlation between the owner-manager's firm and the other stocks in his portfolio. We compare this correlation to the firm's correlation with a randomly chosen Swedish stock, i.e., the average correlation between the firm and other Swedish stocks. We report results for equally- and value-weighted portfolios.

The results for the equally-weighted portfolios suggest that managers choose to invest their remaining wealth in stocks with a significantly higher correlation with their own firm than a randomly chosen Swedish stock. This is inconsistent with owner-managers seeking to minimize their exposure to idiosyncratic risk. However, if we account for the different stocks' weight in the portfolios, owner-managers chose stocks with a similar correlation with their own firms as the average Swedish stock. Hence, it appears as if the average owner-manager chooses other stocks without taking the correlation with the firm in which he has a substantial block into account. This is still inconsistent with owner-managers seeking to minimize their exposure to idiosyncratic risk. In fact, for all owner-managers in our sample, there are other Swedish stocks with a negative correlation with the firm in which they have their main investment.

3.2. Correlation among other stocks

It is not only the correlation with an owner-manager's firm that affects the idiosyncratic risk of the owner-manager's portfolio. The correlation among the other stocks chosen by the owner-manager is also of interest. In Table 4 Panel B, we report the correlation between the other stocks in the owner-managers' portfolios. The average correlation between the other stocks in the owner-managers' portfolios is 0.291. If the owner-manager's firm is included, the average correlation is 0.283. These correlations are compared to the average correlation between Swedish stocks. If the owner-managers were to pick two other stocks at random, they would have a significantly lower correlation coefficient at 0.227. Thus, it appears as if the owner-managers choose other stocks with a significantly higher correlation between themselves than the average stocks. We return to this issue in section 3.4.

Table 4

Risk characteristics owner-managers' portfolios

In this table, we provide the risk characteristics of the owner-managers' portfolios of Swedish equity. The sample used in this study consists of the equity portfolios held by 109 owner-managers (CEO or Chairman) active in Swedish firms as of December 28, 2001. *Correlation (firm, other portfolio stocks)* is the average correlation between the owner-manager's firm and the other stocks in his/her portfolio of Swedish equity. *Correlation (firm, other Swedish stocks)* is the average correlation between the owner-manager's firm and other Swedish stocks. *Correlation portfolio stocks* the average correlation between the stocks in the owner-manager's portfolio of Swedish equity. This is estimated with and without the owner-manager's firm. *Correlation Swedish stocks* is the average (median) correlation between the 255 Swedish stocks used in this study. *Actual portfolio* is the owner-manager's actual portfolio of Swedish equity. *Alternative portfolio* is a portfolio where remaining equity investments, i.e., wealth not invested in the firm, has been invested in the market portfolio. The market portfolio is approximated by AFGX. *Beta* is the Beta for *Actual portfolio* and *Alternative portfolio*, respectively. *Variance* is the annualized variance of value changes for *Actual portfolio* and *Alternative portfolio*, respectively. *Beta* and *Variance* are estimated on weekly equity return data during 2001 (52 observations). *Market risk* is defined as *Beta* squared times the variance of the market portfolio. *Idiosyncratic risk* is defined as *Variance* minus *Market risk*. *, **, and *** denote significance at the 10%, 5% and 1% level, respectively.

Panel A: Correlation between main investment and other stocks in the portfolio

	<i>Correlation (firm, other portfolio stocks)</i>		<i>Correlation (firm, other Swedish stocks)</i>		Difference test	
	Mean	Median	Mean	Median	<i>t</i> -stat	Wilcoxon ranksum stat
Equally-weighted	0.265	0.278	0.226	0.235	1.774*	1.990**
Value-weighted	0.276	0.275	0.277	0.290	0.980	1.004

Panel B: Correlation between stocks in portfolio

	<i>Correlation portfolio stocks</i>		<i>Correlation Swedish stocks</i>		Difference test	
	Mean	Median	Mean	Median	<i>t</i> -stat	Wilcoxon ranksum stat
Excluding firm	0.291	0.292	0.227	0.231	4.955***	4.445***
Including firm	0.283	0.288	0.227	0.231	4.565***	4.588***

Panel C: Risk measures

	<i>Actual portfolio</i>		<i>Alternative portfolio</i>		Difference test	
	Mean	Median	Mean	Median	<i>t</i> -stat	Wilcoxon ranksum stat
<i>Beta</i>	1.061	0.946	1.042	0.975	0.880	0.793
<i>Variance</i>	0.414	0.275	0.389	0.269	2.017**	4.494***
<i>Market risk</i>	0.109	0.065	0.103	0.068	1.287	0.921
<i>Idiosyncratic risk</i>	0.304	0.174	0.286	0.164	2.406**	5.828***

3.3. Unique (idiosyncratic) risk

In Table 4 Panel A, we show that owner-managers do not choose other stocks with a lower correlation with their own firms than the average Swedish stock. In Panel B, we show that the other stocks in the owner-managers' portfolios show a higher correlation between themselves than the average Swedish stocks. In Panel C, we investigate how this affects their portfolio risk. We compare the owner-manager's actual portfolio (*Actual portfolio*) to an alternative portfolio where remaining wealth, i.e., wealth invested on the Swedish stock market but not in the owner-manager's own firm, is invested in the market portfolio (*Alternative portfolio*).¹²

Taking the investment in the firm as a constraint, the optimal strategy for remaining wealth is probably not a combination of the risk-free asset and the market portfolio (Merton, 1971). Thus, the alternative portfolio is not the optimal portfolio. It is a simple alternative that would not require solving for the constrained optimum portfolio weights. Both the *Actual portfolio* and the *Alternative portfolio* have Beta values close to one. However, the return variance is significantly higher for the *Actual portfolio* compared to the *Alternative portfolio*. Moreover, this difference stems from higher idiosyncratic risk. The market risk does not differ between the portfolios. Thus, the owner-managers would significantly reduce their exposure to idiosyncratic risk were they to invest their remaining wealth in the market portfolio instead of the stocks they have chosen.

3.4. Owner-managers in high-tech industries

Our results so far suggest that owner-managers do not seek portfolio diversification when they invest their remaining wealth. An alternative hypothesis is that they seek to exploit their industry-specific superior knowledge and invest their remaining wealth in the same sector as their own firm (i.e., stocks with a high correlation between themselves and with the owner-

¹² The market portfolio is approximated by Affärsvärldens Generalindex (AFGX).

managers' own firms). This would be contrary to portfolio diversification and roughly consistent with our results so far. We conjecture that superior knowledge is most valuable in high-tech industries. The IT and telecoms sectors are defined as high-tech industries and we split the sample according to whether the owner-manager's firm is active in a high-tech industry or not. A firm is defined as being active in a high-tech industry if it reports IT or telecoms as its main sector. 53 owner-managers in our sample (49%) are active in high-tech industries.

In Table 5 Panel A, we report various portfolio characteristics for owner-managers in high-tech industries and traditional industries. The value of the owner-managers' investment in the firm, its fraction of the total portfolio of Swedish equity and the number of firms in the portfolio do not differ between the two subsamples.¹³ However, the risk characteristics, i.e., Beta, variance, market risk, and idiosyncratic risk, are all significantly higher for owner-managers in the high-tech industries. This is, of course, due to the turbulence in the high-tech sectors in 2001. However, the average owner-manager in high-tech industries loses more diversification benefits (*Lost diversification*) from not investing remaining wealth in the market portfolio than the average owner-manager in other industries. This result is not necessarily due to the turbulence in the IT and telecoms sectors. *Lost diversification* is defined as the difference between the *Actual portfolio's* idiosyncratic risk and the *Alternative portfolio's* idiosyncratic risk.

In Table 5 Panels B, C and D, we investigate whether the owner-managers in high-tech industries choose other stock in their portfolios differently from owner-managers in traditional industries. We first concentrate on the correlation with the owner-manager's own firm in Panel B. On average, owner-managers in high-tech sectors chose other stocks that have correlation coefficients with the owner-managers' firm above 30%. Owner-managers in traditional industries chose stocks with a significantly lower correlation with their main investment. On average, the correlation coefficients for the stocks chosen by owner-managers in traditional industries are 0.216 and 0.228 for the equally- and value-weighted portfolio, respectively.

In Panel C, we look at the correlation between the chosen stocks. Again, owner-managers in high-tech industries chose stocks which, among themselves, show correlation coefficients above 0.3. Moreover, owner-managers in traditional industries chose stocks which, among

---

¹³ The skewed distribution (average 1,241 and median 17) of the *Value of manager's investment* in traditional industries is due to one observation. Therefore, the *t*-test does not show a significance difference between high-tech industries and other industries.

themselves, show significantly lower correlations. The same pattern is also evident when the owner-managers main investment is included in the correlation matrix.

Table 5

Risk characteristics and industry composition sorted by high-tech industry (IT and telecoms)

In this table, we provide statistics on the risk-characteristics of the owner-managers' portfolios and split the sample according to whether the owner-manager's firm is active in a high-tech industry (IT or telecoms) or not. The sample used in this study consists of the equity portfolios held by 109 owner-managers (CEO or Chairman) active in Swedish firms as of December 28, 2001. *Value of manager's investment* is the value in million SEK of the owner-manager's investment in the firm as of December 28, 2001. *Fraction of portfolio* is defined as *Value of manager's investment* divided by the value of the owner-manager's total portfolio of Swedish equity. *Number of firms* is the number of Swedish firms in the owner-manager's portfolio of Swedish equity. *Beta* is the Beta for the owner-manager's portfolio of Swedish equity. *Variance* is the annualized variance of value changes for the owner-manager's portfolio of Swedish stocks. *Market Risk* is defined as *Beta* squared times the variance of the market portfolio. *Idiosyncratic Risk* is defined as *Variance* minus *Market risk*. *Lost diversification* is the difference between the idiosyncratic risk of the owner-manager's actual portfolio and the idiosyncratic risk of an alternative portfolio, where remaining wealth - i.e., wealth not invested in the firm - is invested in the market portfolio. The market portfolio is approximated by AFGX. In panel B, the correlation between main investment and other stocks in the portfolio is estimated as the average (equally-weighted and value-weighted) correlation between the owner-manager's firm and the other stocks in his/her portfolio of Swedish equity. In panel C, the correlation between stocks in the portfolio is estimated as the average correlation between the stocks in the owner-manager's portfolio of Swedish equity. This is estimated with and without the owner-manager's firm. In Panel D, *Main sector of total portfolio* is the fraction of the total portfolio that is invested in the same sector as the owner-manager's firm report as its main sector. *Herfindahl total portfolio* is the HI estimated on the industry composition of the total portfolio. *Main sector of remaining portfolio* is the fraction of the remaining portfolio - i.e., wealth not invested in the firm - that is invested in the same sector as the owner-manager's firm report as its main sector. *Herfindahl remaining portfolio* is the HI estimated on the industry composition of the remaining portfolio. *, **, and *** denote significance at the 10%, 5% and 1% level, respectively.

Panel A: Risk measures

	High-tech Industry		Traditional Industries		Difference Test	
	Mean	Median	Mean	Median	t-stat	Wilcoxon ranksum stat
<i>Value of manager's investment</i>	53	9	1,241	17	1.051	1.491
<i>Fraction of portfolio</i>	0.743	0.926	0.830	0.963	1.575	1.301
<i>Number of firms</i>	11	6	11	7	0.269	0.046
<i>Beta</i>	1.445	1.445	0.698	0.586	7.696***	6.287***
<i>Variance</i>	0.629	0.612	0.210	0.139	7.007***	6.305***
<i>Market risk</i>	0.175	0.151	0.047	0.025	6.834***	6.287***
<i>Idiosyncratic risk</i>	0.454	0.419	0.163	0.110	5.698***	5.335***
<i>Lost diversification</i>	0.034	0.001	0.002	0.000	2.167**	1.533

Panel B: Correlation between main investment and other stocks in the portfolio

	High-tech Industry		Traditional Industries		Difference Test	
	Mean	Median	Mean	Median	t-stat	Wilcoxon ranksum stat
Equally-weighted	0.312	0.325	0.216	0.252	3.568***	3.471***
Value-weighted	0.325	0.315	0.228	0.223	3.032***	2.938***

Panel C: Correlation between stocks in the portfolio

	High-tech Industry		Traditional Industries		Difference Test	
	Mean	Median	Mean	Median	<i>t</i> -stat	Wilcoxon ranksum stat
Excluding main investment	0.319	0.314	0.266	0.281	2.103**	1.896*
Including main investment	0.314	0.337	0.251	0.274	2.668***	2.692***

Panel D: Industry Characteristics

	High-tech Industry		Traditional Industries		Difference Test	
	Mean	Median	Mean	Median	<i>t</i> -stat	Wilcoxon ranksum stat
<i>Main sector of total portfolio</i>	0.831	0.966	0.872	0.975	0.964	0.122
<i>Herfindahl total portfolio</i>	0.821	0.934	0.822	0.951	0.040	0.067
<i>Main sector of remaining portfolio</i>	0.418	0.315	0.207	0.143	3.048**	2.236**
<i>Herfindahl remaining portfolio</i>	0.637	0.617	0.519	0.433	1.865*	1.746*

Panels B and C suggest that owner-managers in high-tech industries invest in other stock that are highly correlated among themselves and highly correlated with the owner-managers' main investments. Thus, it appears as if owner-managers in high-tech industries try to exploit their industry-specific superior information (real or perceived). However, so far we have only looked at correlations and not explored which firms and industries the owner-managers actually invest in. We turn to this issue in Panel D.

We first look at how much of the portfolio that is invested in the main industry, i.e., the industry in which the owner-manager's firm is active. With respect to this measure, the portfolios of owner-managers in high-tech industries show no significant differences compared to the portfolios of owner-managers in traditional industries. As an alternative measure, we estimate the HI based on the portfolio's industry composition. The HI also suggests no significant differences.

However, the results based on the remaining wealth suggest significant differences. Owner-managers in high-tech industries invest significantly more of their remaining wealth in the same sector as their main investment. The median owner-manager in the high-tech industry invests 31.5% of his remaining wealth in high-tech stocks. The median owner-manager in traditional industries invests 14.3% of his remaining wealth in the same sector as his main investment. Should the owner-manager seek diversification, this should probably be zero. Estimating the HI for remaining wealth alone suggests a similar pattern. Owner-

managers in high-tech industries concentrate the remaining wealth in the main sector to a larger extent. The difference is significant at the 10% level.

During the IT boom, individuals generally invested substantial amounts in IT stocks. Do owner-managers in the high-tech industry really choose to invest their remaining wealth in the same industry as their major investments or is this result driven by a spurious correlation, i.e., do owner-managers in other industries also invest a large fraction of their remaining wealth in the IT sector? For them, this would look like diversification; for owner-managers in high-tech firms, it would look like “specialization”. We test this hypothesis and find that owner-managers within high-tech industries invest significantly more of their remaining wealth in IT stocks than owner-managers in traditional industries. The median high-tech manager invests 45% of their remaining wealth in IT stocks, whereas the median manager in traditional industries invests 24% of his remaining wealth in IT stocks (unreported).

3.5. Cross-sectional regressions

So far, we have not controlled for factors that may affect the owner-managers’ portfolio choices. Younger individuals may be more willing to hold more risky portfolios. Likewise, wealthier individuals may be more willing to hold more risky portfolios. Moreover, CEOs may, to a larger extent, hold restricted stocks which they are not allowed to sell. CEOs may also have more industry-specific superior knowledge than chairmen. Is it these types of spurious correlations that drive the results reported above?

Indeed, we find that younger individuals and CEOs hold more risky portfolios (unreported). However, the CEO results appear to be explained by age - i.e., CEOs are on average significantly younger than chairmen. Moreover, the age results appear to stem from age being positively correlated with wealth. In summary, older individuals are wealthier and they are more likely to be chairmen than CEOs.

In Table 6, we report cross-sectional regression with various portfolio characteristics as explanatory variables. An indicator variable, *IT-DUMMY*, is used as an approximation of the amount of industry-specific superior knowledge that the owner-manager possesses. *IT-DUMMY* is equal to 1 if the owner-manager’s firm is active in IT or telecoms. We control for the owner-manager’s age, whether the owner-manager is CEO, and the value of the owner-manager’s portfolio of Swedish equity.

In model specification M1, *Lost diversification* is the dependent variable. *Lost diversification* is defined as the difference between the *Actual portfolio’s* idiosyncratic risk

and the *Alternative portfolio's* idiosyncratic risk. The *IT-DUMMY* variable is positively significant, indicating that owner-managers in high-tech industries give up more diversification by not investing in the market portfolio, compared to owner-managers in other industries. The control variables are all insignificant. In model specification M2-M5, we investigate what aspects of the portfolio choice of owner-managers in high-tech industries could explain why they forfeit more diversification benefits than owner-managers in other industries. Is it that they invest: i) in other stocks that are highly correlated with their firms? ii) in other stocks that are highly correlated among themselves, iii) or due to the industry composition of the total portfolio and/or the industry composition of the other stocks?

Table 6

Cross-sectional OLS regressions with various portfolio risk characteristics as dependent variables

In this table, we report OLS regression results. The sample used in this study consists of the equity portfolios held by 109 owner-managers (CEO or Chairman) active in Swedish firms as of December 28, 2001. Various portfolio risk characteristics have been used as dependent variables. *Lost diversification* (M1) is defined as the difference between the idiosyncratic risk of the owner-manager's actual portfolio and the idiosyncratic risk of an alternative portfolio, where remaining wealth, i.e., wealth not invested in the firm, is invested in the market portfolio. *Correlation (firm, other portfolio stocks)* (M2) is the value-weighted average correlation between the owner-manager's firm and the other stocks in the manager's portfolio of Swedish equity. *Correlation other portfolio stocks* (M3) is the average correlation between other stocks in the owner-manager's portfolio (estimated without the shares in the owner-manager's firm). *Main sector of total portfolio* (M4) is the fraction of the total portfolio that is invested in the same sector as the owner-manager's firm. *Main sector of remaining portfolio* (M5) is the fraction of the remaining portfolio, i.e., wealth not invested in the owner-manager's firm, which is invested in the same sector as the owner-manager's firm. Coefficients are reported with heteroscedasticity-robust *t*-values in parentheses (White, 1980). 20 owner-managers only own stocks in one firm. Therefore, in the models where the dependent variable requires at least 2 stocks, the sample is reduced to 89. Furthermore, 11 owner-managers only own stocks in 2 firms. Therefore, in M3, where the dependent variable requires 3 stocks, the sample is reduced to 78. *IT-DUMMY* is equal to 1 if the owner-manager's firm reports IT or telecoms as their main sector, and zero otherwise. *AGE* is defined as the owner-manager's age. *CEO DUMMY* is equal to 1 if the owner-manager is CEO in the firm, and zero otherwise. *LN WEALTH* is defined as the natural logarithm of the value of the owner-manager's portfolio of Swedish equity. *, **, and *** denote significance at the 10%, 5% and 1% level, respectively.

	M1 <i>Lost diversification</i>	M2 <i>Correlation firm, other portfolio stocks</i>	M3 <i>Correlation other portfolio stocks</i>	M4 <i>Main sector of total portfolio</i>	M5 <i>Main sector of remaining portfolio</i>
<i>IT-DUMMY</i>	0.0336** (2.06)	0.1345*** (4.25)	0.0533* (1.82)	-0.1213** (-2.13)	0.2608*** (3.42)
<i>AGE</i>	0.0007 (1.47)	0.0054*** (2.77)	-0.0011 (-0.66)	-0.0089** (-2.27)	0.0074 (1.40)
<i>CEO DUMMY</i>	-0.0001 (-0.05)	0.0571* (1.67)	0.0446 (1.51)	0.0811 (1.23)	0.0921 (1.05)
<i>LN WEALTH</i>	-0.0039 (-1.65)	0.0118 (1.21)	0.0051 (0.92)	0.0153 (1.33)	0.0126 (0.88)
Number of obs.	109	89	78	109	89
Adj R^2	0.022	0.146	0.073	0.125	0.084

In model specification M2, *Correlation firm, other portfolio stocks* is the dependent variable. It is defined as the value-weighted average correlation between the return of the owner-manager's firm and the other stocks in the owner-managers portfolio. Again, the *IT-DUMMY* is positively significant, indicating that owner-managers in high-tech industries in particular chose to invest remaining wealth in stocks that are highly correlated with the firm in which they have their major investment. *AGE* and *CEO DUMMY* are also positively significant at the 1% and 10% level, respectively.

In model specification M3, *Correlation other portfolio stocks* is the dependent variable. It is defined as the average correlation between among the other stocks in the owner-manager's portfolio. The *IT-DUMMY* is positively significant at the 10% level. Thus, not only do owner-managers in high-tech industries choose other stocks that are highly correlated with their major investment, they also choose stocks that are highly correlated among themselves. The control variables are all insignificant in M3.

In model specification M4, *Main sector of total portfolio* is the dependent variable. It is defined as the fraction of total stock portfolio wealth invested in the same industry as the owner-manager's major investment. The *IT-DUMMY* is negatively significant, indicating that owner-managers in high-tech industries in fact have a smaller proportion of their portfolio of Swedish equity in the same industry as their major investment. This stems from the fact that owner-managers in high-tech industries have invested less of their wealth in their own firms compared to owner-managers in other industries. It is not a result of owner-managers investing their remaining wealth outside the industry in which they have their major investment. This is evident from M5.

In model specification M5, *Main sector of remaining portfolio* is the dependent variable. It is defined as the proportion of the owner-manager's remaining wealth that is invested in the same sector as the owner-manager's firm reports as its main sector. The *IT-DUMMY* is positive and highly significant. This is stronger evidence, consistent with the argument that owner-managers in high-tech industries try to exploit their industry-specific superior knowledge when investing their remaining equity wealth in the stock market.

3.6. Optimal portfolios

Merton (1971) points out that, given investment constraints, the optimal portfolio is not a combination of the risk-free asset and the market portfolio. Thus, given the large investment

in the main firm, remaining wealth could probably be invested better than in the market portfolio. In this section, we investigate this issue.

We first solve for the owner-manager's optimal portfolio given the large investment in the own firm. This portfolio is labeled the *Hedge portfolio*. This is done by taking the volatility of the actual portfolio as given and maximizing the expected return. Thus, we conjecture that the volatility of the *Actual portfolio* captures the owner-managers' risk-aversion and find the maximum expected return given the chosen risk. The owner-manager can choose to invest in 10 different industry indices.¹⁴ The expected return is defined according to CAPM where the risk-free rate is set to 2% and the market risk-premium to 5%.¹⁵ Second, we solve for the *Optimal portfolio* where the expected return is maximized given the same volatility as the *Actual portfolio*. Finally, we compare the Sharpe ratios for the different portfolios.

In Table 7 Panel A, we report the expected return, the volatility and the Sharpe ratio of the *Actual portfolio*, the *Alternative portfolio*, the *Hedge portfolio* and the *Optimal portfolio*. The mean volatility is not the same for the *Actual portfolio*, the *Hedge portfolio* and the *Optimal portfolio*, since it is not always possible to construct a portfolio with the same volatility as the *Actual portfolio* using the 10 sector indices. The medians are, however, the same for these three portfolios. It differs for the *Alternative portfolio*, since it is constructed without conditioning on volatility. We therefore focus on the Sharpe ratios. The mean and median Sharpe ratios increase linearly when we go from the actual portfolio to the *Optimal portfolio*. In Table 7 Panel B, the difference tests show that: i) the *Alternative portfolio* has a significant higher Sharpe ratio than the *Actual portfolio*; ii) the *Hedge portfolio* is significantly better than the *Alternative portfolio*; and iii) the *Optimal portfolio* is superior to the *Hedge portfolio*. However, even though statistically significant, the economic importance of the difference between the *Actual portfolio* and the *Alternative portfolio* and the *Hedge portfolio*, respectively, is moderate. The median Sharpe ratio of the *Actual portfolio* is 0.095. The Sharpe ratio of the *Hedge portfolio* is 0.101. The small difference is a function of the fact that, on average, remaining wealth is a small part of the owner-managers' equity portfolios, just over 20%. Our results suggest that even if it possible to form statistically better portfolios using this 20%, the economic difference is small.

Finally, we note that the median owner-manager in our sample could have increased the Sharpe ratio of his equity portfolio by 45% (0.174 compared to 0.095) if he were to sell the

---

¹⁴ We choose to focus on the portfolio's industry composition in order to conform to the results reported above. Furthermore, using all the traded Swedish stocks in the optimization would be computationally extensive.

¹⁵ The choice of risk-free rate and market risk-premium does not qualitatively affect our results.

large block. This is a casual estimate of the cost of under-diversification. Heaney and Holmen (2004) use direct estimates of Swedish owner-managers' total wealth and an approach based on utility functions. Given a constant relative risk aversion parameter of 2, they report a median cost associated with under diversification of 17%. The difference between our estimate of under-diversification (45%) and Heaney and Holmen's (2004) estimate might be a result of the different wealth estimates used. In this paper, we only use wealth invested in Swedish equity. Heaney and Holmen use estimates of total wealth and report that the average owner-manager has roughly 50% of their total wealth invested in their own firm.

Table 7

Expected return, volatility and Sharpe ratio for portfolios

In this table, we provide statistics on the characteristics of the owner-managers' actual portfolio (*Actual portfolio*), the alternative portfolio where remaining wealth is invested in the market portfolio (*Alternative portfolio*), a hedge portfolio where remaining wealth is invested optimally in 10 different sector indices based on the 10 sectors in the GICS (*Hedge portfolio*), and the optimal portfolio (maximum expected return) with the same volatility as the actual portfolio (*Optimal portfolio*). The *Hedge portfolio* should conform to Merton's (1971) argument that, given certain investment constraints, the optimal portfolio is not a combination of the risk-free asset and the market portfolio. When forming the *Optimal portfolio*, 10 sector indices are used. The market portfolio is approximated by AFGX. Expected return is defined as the risk-free rate plus the portfolio Beta times the market risk-premium. The risk-free rate is set to 2% and the market risk-premium to 5%. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: Characteristics of the owner-managers' actual portfolio, the alternative portfolio where remaining wealth is invested in the market portfolio, a hedge portfolio where remaining wealth is invested optimally in 10 different sector indices, and the optimal portfolio with the same volatility as the actual portfolio.

		Mean	Median
<i>Actual portfolio</i>	Expected Return	0.073	0.067
	Standard Deviation	0.579	0.524
	Sharpe Ratio	0.094	0.095
<i>Alternative portfolio</i>	Expected Return	0.072	0.069
	Standard Deviation	0.558	0.519
	Sharpe Ratio	0.100	0.098
<i>Hedge portfolio</i>	Expected Return	0.076	0.069
	Standard Deviation	0.567	0.524
	Sharpe Ratio	0.103	0.101
<i>Optimal portfolio</i>	Expected Return	0.103	0.111
	Standard Deviation	0.475	0.524
	Sharpe Ratio	0.176	0.174

Panel B: Mean and median difference tests of the portfolios' Sharpe ratios

	<i>t</i> -test statistic	Wilcoxon signed-rank test statistic
<i>Actual portfolio</i> – <i>Alternative portfolio</i>	3.635***	2.200**
<i>Alternative portfolio</i> – <i>Hedge portfolio</i>	2.715***	5.513***
<i>Hedge portfolio</i> – <i>Optimal portfolio</i>	17.656***	9.050***

4. Summary and conclusion

Previous empirical work has found that investors tend to hold under diversified portfolios made up of a limited number of stocks on which the investors have superior information. Furthermore, there is evidence that managers concentrate large fractions of their wealth in the equity of their own firm. In this paper, we use a unique data set and investigate how Swedish owner-managers invest remaining wealth conditional upon a major investment in their own firm. We find limited evidence that owner-managers choose to invest remaining wealth in stocks that show a low correlation with the firm in which they have a substantial fraction of their wealth invested. Owner-managers also choose other stocks that show a higher correlation among themselves than the average Swedish stocks. Our results appear to be driven by managers in high-tech industries who invest their remaining wealth in the IT and telecoms sectors. We conjecture that the value that owner-managers attach to their industry-specific knowledge should be highest in these sectors and conclude that, instead of seeking diversification benefits, owner-managers seek to exploit their superior information when they choose which stock to invest their remaining wealth in.

We also document that owner-managers would be better off were they to invest their remaining wealth in the market portfolio. However, the owner-managers would be better off still were they to invest their remaining wealth in a portfolio that would hedge their main investment. Finally, by comparing Sharpe ratios, we provide a casual estimate of the cost the owner-managers bear in terms of under-diversification. On average, the owner-managers could have improved their Sharpe ratios by 45% had they sold their main investment and invested in a well-diversified portfolio.

References

- Barber, B. M. and T. Odean, 2000, "Trading is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors", *Journal of Finance*, 55, 773-806.
- Bitler, M., T. Moskowitz, and A. Vissing Jorgensen, 2005, "Testing Agency Theory with Entrepreneur Effort and Wealth", *Journal of Finance*, 60, 539-576.
- Carpenter, J. N., 2000, "Does option compensation increase managerial risk appetite?", *Journal of Finance*, 55, 2311-2331.
- Coval, J. D. and T. J. Moskowitz, 1999, "Home Bias at Home: Local Equity Preference in Domestic Portfolio", *Journal of Finance*, 54, 2045-2073.
- Coval, J. D. and T. J. Moskowitz, 2001, "The Geography of Investment: Informed Trading and Asset Prices", *Journal of Political Economy*, 109, 811-841.
- Fama, E., 1980, "Agency Problems and the Theory of the Firm", *Journal of Political Economy*, 88, 288-307.
- Fama, E., and M. C. Jensen, 1983, "Agency Problems and Residual Claims", *Journal of Law and Economics*, 26, 327-349.
- Goetzmann, W. N., and A. Kumar, 2001, "Equity Portfolio Diversification", NBER Working Paper, W8686.
- Goetzmann, W. N., M. Massa, and A. Simonov, 2003, "Portfolio Diversification, Proximity Investment and City Agglomeration", working paper, INSEAD
- Grinblatt, M., and M. Keloharju, 2001, "How Distance, Language, and Cultural Influence Stockholdings and Trades", *Journal of Finance*, 56, 1053-107.
- Hau, H., 2001, "Location Matters: An Examination of Trading Profits", *Journal of Finance*, 56, 1959-1983.
- Himmelberg, C., G. Hubbard, and D. Palia, 1999, "Understanding the Determinants of Managerial Ownership and the Link Between Ownership and Performance", *Journal of Financial Economics*, 53, 353-384.
- Heaney, Richard, and M. Holmen, 2004, "The Cost to the Owner-Manager of Under-Diversification", working paper, Uppsala University.
- Heaton, J. and D. Lucas, 2000, "Portfolio Choice and Asset Prices: The Importance of Entrepreneurial Risk", *Journal of Finance*, 55, 1163-1198.
- Jensen, M., 1986, "Agency Costs of Free Cash Flow", *American Economic Review*, 323-329.
- Jensen, M., and W. Meckling, 1976, "The Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure", *Journal of Financial Economics*, 3, 305-360.
- Lambert, R., D. Larcker, and R. Verrecchia, 1991, "Portfolio Considerations in Valuing Executive Compensation", *Journal of Accounting Research*, 29, 129-149.
- Leland, H., and D. Pyle, 1977, "Informational Asymmetries, Financial Structure, and Financial Intermediation", *Journal of Finance*, 32, 371-387.
- Merton, R. C., 1971, "Optimum Consumption and Portfolio Rules in a Continuous-Time Model", *Journal of Economic Theory*, 3, 247-413.
- Merton, R. C., 1987, "A Simple Model of Capital market Equilibrium with Incomplete Information", *Journal of Finance*, 42, 483-510.
- Muelbroek, L., 2001, "The Efficiency of Equity- Linked Compensation: Understanding the Full Cost of Awarding Stock Options", *Financial Management*, Summer, 5-30.
- Ofek, E. and D. Yermack, 2000, "Taking Stock: Equity-Based Compensation and the Evolution of Managerial Ownership", *Journal of Finance*, 55, 1367-1384.
- Stulz, R., 1990, "Managerial Discretion and Optimal Financing Policies", *Journal of Financial Economics*, 20, 25-54.

Sundin, A. and S. I. Sundqvist, 2002, "Owners and Power in Sweden's Listed Companies",
Bull Tryckeri AB, Halmstad.