CEO Personal Wealth, Equity Incentives and

Firm Performance

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Abstract: In this paper, we employ unique data on the personal wealth of the CEOs' of the listed Swedish firms to explore whether the proportion of CEO's total wealth invested in her firm increases her incentives and, consequently, the performance of her firm. Consistent with this hypothesis our results show that the greater is the proportion of CEO's wealth tied to her firm, the greater is the accounting profitability. Our results are robust for different alternative estimation methods and when various firm differences are controlled for.

1. Introduction

A central prediction from theoretical agency models is that managerial ownership such as the CEO ownership of the firm increases management's incentives and, consequently, the performance of the firm (e.g. Jensen and Meckling, 1976). However, empirical evidence from testing this prediction is mixed (for a review, see e.g. Core, Guay and Larcker, 2003). The lack of the empirical evidence on the positive relationship between the managerial ownership and the firm performance is explained by econometric problems in estimating the true managerial ownership-performance relationship (Demsetz and Villalonga, 2001) and by already-optimal levels of managerial ownership, which leaves no room for the cross-sectional variation in the ownership-performance relationship (Demsetz and Lehn, 1985). These theoretical and empirical studies have focused on the CEO ownership as a fraction of the firm, and they usually pay no attention to the role of the manager's ownership as a proportion of outside wealth in determining incentives.

In this paper, we use unique data on the personal wealth of the CEOs' of the listed Swedish firms including CEOs' holdings in their insider and outsider stocks and their other wealth to explore the incentive effects of CEO's total personal wealth and her ownership in the firm she is managing. Specifically, we explore whether the proportion of CEO's total wealth invested in her firm, which we call CEO's wealth ratio, increases her incentives and, consequently, the performance of her firm. A relatively small proportion of firm's shares owned by the CEO may represent a significant proportion of her personal wealth, if the value of the personal wealth is modest. Accordingly, a relatively large proportion of shares owned by CEOs may represent only a small proportion of her wealth, if the value of the wealth is large. We hypothesize that the incentive effect of the CEO ownership increases with the fraction of her personal wealth invested in her firm and contribute to literature on the incentive effects of the managerial equity ownership by evaluating the CEO equity ownership relative to her total wealth.

Consistent with the stated hypothesis our empirical results show that the ratio of CEO's ownership in her firm to her personal wealth is positively related to the accounting profitability of the firm. In order to cope with the inherent endogeneity between the value of the company's stock hold by CEO and the firm performance, we transform the market-value-based wealth ratios into the book-value based. The results hold for both specifications. In addition, using CEO's fractional ownership as a proxy for performance-enhancing incentive does not provide consistently stable outcomes. Our results are robust for different sensitivity checks. The remainder of the paper is structured as follows: Section 2 reviews the relevant literature; Section 3 describes our data and our research method; Section 4 reports the empirical results together with the robustness tests; Section 5 concludes the paper.

2. Prior research and hypothesis development

Classical agency models (Berle and Means, 1932; Jensen and Meckling, 1976) predict that manager can undertake actions which are undesired from the shareholders' perspective as a result of less-than-optimal alignment of agent's and principal's interests. A natural solution to this problem is the establishment of incentive contracts. Along with motivating compensation schemes, providing a manager with a company's stake is an important device for reduction of agency costs arising from a separation of ownership and control within a firm. Agency theory argues that greater equity holdings owned by corporate management should enhance firm performance.

Monetary incentives are traditionally measured as a percentage change in CEO's compensation or value of firm-related stock and stock option holdings in response to percentage change in total value of the firm (Jensen and Murphy, 1990b). Therefore incentives generated by equity are represented through CEO's fractional ownership in her firm. However, besides inherent endogeneity in relation to performance (Demsetz and Lehn, 1985) this measure is also criticised by the fact that given the huge market values of companies, a CEO ownership represents a relatively modest fraction of the total value of the firm (Morck, Shleifer and Vishny, 1988; Jensen and Murphy, 1990a). Yet, equity incentives are important in comparison to other monetary incentives of CEOs. For instance, Hall and Liebman (1998) conclude that sensitivity generated by holdings of stock and stock options is huge relatively to pay to performance sensitivity from direct compensation.

Many studies have examined the relationship between the CEO ownership as a fraction of the firm and the profitability of the firm, but the results from these studies are mixed.

Morck, Shleifer and Vishny (1988) estimate a piecewise regression and find a positive relation when the ownership percentage is below 5% and above 25%, consistent with the alignment of interests of agent and principal. However in the interval between 5% and 25% of insiders' holdings Morck, Shleifer and Vishny (1988) report decreasing relation between the ownership and performance explaining it with the entrenchment hypothesis. Cho (1998) and Holderness, Kroszner and Sheehan (1999) find similar results when using Tobin's Q as a dependent variable, but not in the case of accounting profitability. Mehran (1995) finds a positive linear relation between percentage of shares held by the top managers and the profitability of the firm in the sample of 153 manufacturing firms. However, Demsetz and Lehn (1985) do not find significantly positive relation between the managerial ownership and the firm performance. In addition, Yermack (1996) and Cornett et al. (2008) report, among other things, that the managerial ownership is not significantly related to the firm performance.

A proportion of CEO's total outside wealth invested in her company (hereafter wealth ratio) has not been considered as an alternative measure of CEO's incentives in the prior research mainly because of the lack of data on CEO's outside wealth and absence of appropriate theory. CEO's outside wealth is typically used as a proxy of risk aversion in agency models, which hypothesise that richer CEOs have better incentives to undertake riskier projects which generate higher returns, for example in the context of employee stock options and restricted stock valuation (Hall and Murphy, 2002; Kahl, Liu and Longstaff, 2003). Proponents of ownership being in equilibrium argue that managerial outside wealth is one of factors which determine the optimal sharing rate (e. g. Becker, 2006). The problem in testing these models is that insiders' non-firm wealth is not available from public sources. One approach to overcome it is to express managerial outside wealth as a

multiple function of annual compensation (Hall and Murphy, 2002, Armstrong, Larcker, Su, 2007). An alternative way to address this issue is to calculate wealth accumulation over the manager's (CEO's) career. May (1995) constructs this measure by examining both the value of current equity holding and by taking into account accumulation of cash compensation earned through the CEO's career path. Similar approach is employed by Dittman and Maug (2007). Obviously, both of these methods of outside wealth determination are a subject to a severe measurement error. To the best of our knowledge, Becker (2006) is the only study using actual data on executives' outside wealth.

The concept of CEO's wealth ratio as an incentive is not exactly tied to the agency theory. Classical agency theory (Jensen and Meckling, 1976, Holmstrom, 1979) investigates managerial fractional ownership as an optimal sharing rate between the agent and the principle needed to avoid excess consumption of company's non-pecuniary benefits by the manager and to encourage efficient decision-making. The sharing rate or equity-based pay-performance sensitivity shows change in *absolute* value of CEO's wealth (dollar change) induced by change in the market value of the firm. Likewise, the elasticity of CEO's wealth with respect to firm value should be reflected in terms of percentage change of these amounts (Murphy, 1999). Wealth ratio or CEO's holdings scaled with her outside wealth represents elasticity of her total wealth with respect to the market value of the firm provided by equity[1]. For example, if CEO's wealth ratio equals to 0.5, the increase in the market value of equity by 10 percent would result in CEO's total wealth increase by 5 percent.

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[1]In this paper we tie our discussion only to change in wealth generated by shareholdings.

Based on this discussion, the question whether absolute or relative change in CEO's wealth should provide a better measure of incentives arises. If CEO's stake constitutes a large proportion of her wealth, and it is large in absolute amount, which is usually the case of small firms, both wealth ratio and fractional ownership should reflect incentives, as they would approximate each other. However when fractional ownership is low, it barely can constitute an appropriate measure of CEO's incentives, consistent with prior criticism of this variable (Morck, Shleifer and Vishny, 1988; Jensen and Murphy, 1990a). In these situations scaling value of CEO's holding with her outside wealth can be more appropriate for capturing the effect of CEO's incentives on her effort than the fractional ownership. We predict that CEO's wealth ratio should affect her effort, which would be mirrored through the company performance.

Despite the lack of the prior research on the effects of CEO's firm holdings in relation to her outside wealth on the company's performance, arguments supporting this hypothesis can be found in the literature. Liu and Yermack (2008) address indirectly the question of the effect of CEOs' personal wealth on the firm performance. They examine stock returns after CEO's real estate purchases, which are financed with the sale of company's shares and options, and consequently with the decrease of CEOs' ownership. Liu and Yermack (2008) report that a decrease in the CEO's personal ownership of the firm affects negatively firm performance, explaining it with CEO's entrenchment. On the other hand, financing house purchases with the sale of stocks decreases CEO's wealth tied to the firm as a result of wealth transfer from stockholdings to real estate that could provide an alternative explanation for performance deterioration assessed by investors. Bitler, Moskovitz and Vissing-Jorgensen (2005) analyse incentive-effort-performance relation in the entrepreneurial settings. They show that outside wealth determines firm ownership, and it is

also negatively related to effort as measured by hours worked. They also demonstrate that effort and ownership relate to performance while controlling for endogeneity issues.

3. Data and methodology

3.1. Data environment

We employ data on Swedish CEOs obtained from the Swedish tax authorities, NCSD (The Nordic Central Securities Depository Group)[2] and from Thomson Datastream. Specifically, data on CEOs' stockholdings in their own firm and in other (outside) firms are from NCSD, which maintains an electronic database on the ownership of all Swedish stocks. For each CEO, this data include the ownership records of all stocks owned at the end of December each year. Data on CEOs' other wealth (real estate, mutual funds, bank holdings and investments in debt securities) and taxable income come from the Swedish tax authorities and are based on the official state tax records[3]. Accounting and stock market data are retrieved from the Thomson Datastream. For firms missing from Thomson's Datastream, we retrieve data from Bureau van Dijk global database[4]. Our sample period is from 1999 to 2005. In the final sample, there are 1308 firm-year observations comprising

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[2] As an official securities depository and clearing organization, NCSD (www.ncsd.eu) plays a crucial role in the Nordic financial system. NCSD currently includes VPC and APK, the Swedish and Finnish Central Securities Depositories, to which all actors on the Nordic capital markets are directly or indirectly affiliated. NCSD is responsible for providing services to issuers, intermediaries and investors, as regards the issue and administration of financial instruments as well as clearing and settlement of trades on these markets.

[3] Data on other wealth obtained from the tax authorities includes the tax-based values of insider and outsider stockholdings.

[4] Bureau van Dijk databases can be accessed e.g. via Wharton Research Data Services provided by Wharton Business School.

301 firms and 355 CEOs. Table 1 reports descriptive statistics on Swedish CEOs' wealth. The results show that a CEO's ownership in her own firm constitutes a great part of her total wealth.

(Insert Table 1 about here)

3.2. Methodology

To investigate the motivating effect of CEO's wealth ratio on her effort we regress future accounting performance measures on six wealth ratio specifications. A better way to test our predictions would be to use some more direct measure of effort, like working hours (Bitler, Moskovitz and Vissing-Jorgensen, 2005). However, CEOs' effort is more related to the efficiency of decision-making and is hardly observed; therefore we perceive future accounting profitability to be a sufficient proxy of the CEO's effort.

In the tests of the effect of managerial ownership on the firm performance, there is no consensus concerning whether stock-based or accounting variable would better reflect such relationship. While accounting-based measures can be a subject to different accounting policies and manipulations, stock market performance indicators respond to information unrelated to a firm and are affected by behavioral biases of investors (Demsetz and Villalonga, 2001). Even though stock market measures of performance capture directly wealth maximisation consistent with the agency theory prediction, accounting profitability should better reflect incentives as it is under the greater control of a CEO. Another

argument in support of accounting profitability usage is its backward-looking nature, which justifies incentive-performance causality. CEOs ownership incentives and effort in current period should be reflected in the accounting profitability of future periods. In contrast, stock market performance incorporates future expectations; therefore current stock market performance should reflect future managerial ownership. In this case the direction of incentive-performance relation is not conformed to. We also believe that equity incentives have a long-term effect resulting in superior future performance, in comparison to short-term motives of bonuses, which lead to earnings management. In addition, Core, Guay and Larcker (2003) advise to use transfer function approach by incorporating leads and lags to provide evidence on the directionality between equity ownership and firm performance. Therefore we use future accounting profitability as a dependent variable in our models.

The wealth ratio measured as a market value of CEO's holdings in her firm divided by her outside wealth can exhibit endogeneity when being regressed on performance, as both are exposed to change with a share price resulting from factors beyond CEO control. Therefore stock-based firm performance measures, such as price-to-book ratio or Tobin's Q are mechanically related to the wealth ratios. Impact of price changes on accounting profitability is less severe, however still handicapped, particularly for predicting future accounting profitability, as the current market value reflects growth opportunities and future firm performance. Therefore, in order to avoid this endogeneity between test variables, we construct a proxy for wealth ratios based on book value of CEO's holdings in her firm. Book value of equity contains only past earnings information and in unaffected by the future. Thus, there should not be any endogenous relationship between the current book value and the future operating performance. However, book-value based wealth ratios are not precise measures of CEO's wealth tied to her firm. Therefore we use both market-value

based and book-value based CEO's wealth ratios in our empirical analysis and believe that inclusion of both specifications mitigates technical problems with these variables described above and increase the validity of our results.

We test our hypothesis by estimating the following model:

(1) $\quad Performance_{it+1} = \beta_0 + \beta_1 Incentives_{it} + \beta_2 Control\ Variables_{it} + \varepsilon_{it}$.

The dependent variable in Model (1), i.e. the firm performance, is the accounting profitability measured as the operating return on total asset ($OPER\_PERF_{it+1}$) for firm i in the $t+1$.

The independent variables in Model (1) are those measuring CEO's equity incentives and control variables. We employ the following variables to measure a CEO's equity incentives. $GROSSWEALTHB_{it}$ is the book value of CEO's holdings in her firm i divided by the value of her total wealth (the book value of holdings in her firm, the market value of her holdings in all outsider stocks and the value of her other wealth) in the end of year t. $NETWEALTHB_{it}$ is the book value of CEO's holdings in her firm divided by the value of her total net wealth (the book value of holdings in her firm, the market value of her holdings in all outsider stocks and the value of her other wealth minus her debt) in the end of year t. $STOCKWEALTHB_{it}$ is the book value of CEO's holdings in her firm i divided by the value of her all stock holdings (the book value of holdings in her firm and the market value of her holdings in all outsider stocks) in the end of year t.

In addition to the book-value-based wealth ratios, we use market-value-based wealth ratios, which are based on market values of CEO's firm holdings. Specifically, we calculate

the following market-value-based wealth ratios: $GROSSWEALTHM_{it}$ (market value of CEO's holdings in her firm i divided by the sum of market value of her holdings in all insider and outsider stocks and the value of her other wealth), $NETWEALTHM_{it}$ (market value of CEO's holdings in her firm i divided by the sum of market value of her holdings in all insider and outsider stocks and the value of her other wealth after deducting her debt) and $STOCKWEALTHM_{it}$ (market value of CEO's holdings in her firm i divided by the sum of market value of her holdings in all insider and outsider stocks). Finally, we use the market value of CEO's holdings in her firm i divided by the market value of firm i in the end of year t ($OWNERSHIP_{it}$) as the fourth measure of a CEO's equity incentives, because prior research on equity incentives has extensively employed it[5].

Control variables in Model (1) are measuring other factors that are likely to affect firm performance. First, we include a natural logarithm of sales of the i company for the year t ($LOGSALES_{it}$) to control for a possible size effect. Second, debt-to-asset ratio ($DEBT\_RATIO_{it}$) at the end of year t is included to capture the effect of leverage on the company's performance. Third, some CEOs may purchase (sell) the stocks of their firm in open market transactions, if the firm is performing well (poorly). Such buying (selling) increases (decreases) the CEO ownership in her firm, but it may reflect a CEO's positive (negative) expectation of her firm rather than incentive effects. We control for the potential bias by including in Model (1) a net-purchasing ratio (NPR_{it}) of a CEO's open market purchases and sales of the stocks of her firm as an additional control variable. Specifically, we calculate a CEO's net-purchasing ratio for year t by dividing the number of stocks she

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[5] We assume this variable to be exogenous similar to Mehran (1995) and skip discussion of heterogeneity in firm contracting environment as in Himmelberg, Hubbard and Palia (1999), as the primary purpose of the paper is testing the effect of wealth ratios on the firm performance.

has purchased during year *t* minus the number of stocks she has sold during year *t* by the total number of the stocks she purchased and sold during year *t*. This variable ranges between -1 (all transactions are purchases) and 1 (all transactions are sales). Finally, we include in our model yearly dummy variables as well as industry dummy variables based on Barth, Beaver and Landsman (1998).

3.3. Descriptive statistics of the variable used in the regressions

Table 2 presents descriptive statistics of key variables. A median value of the fraction of the firm owned by a CEO is only 0.2 percent indicating that Swedish CEOs own only a small proportion of their own firm. However, CEOs' ownership in their own firms constitute much greater part of their personal wealth. For instance, the mean value of a CEO's ownership in her own firm relative to her net wealth (total wealth minus debt) is as high as 57.9 percent. Moreover, an average CEO's ownership in her own firm is more than 75 percent of her total stock portfolio. These numbers clearly illustrate that the incentive effects of the CEO's equity ownership should be assessed by comparing the CEO ownership to a CEO's personal wealth rather than to the total capitalization of the firm she is running. The values of the book-value based wealth ratios are slightly downwards biased, because the book value of equity is usually lower than the market value. Even though both fractional ownership and wealth ratio theoretically vary from zero to one (with the exception of the net wealth ratio), variation of wealth ratios is much greater than that of

fractional ownership that represents an additional advantage of these measures for empirical testing.

(Insert Table 2 about here)

Table 3 reports the Pearson correlation coefficients between the variables. Correlation coefficients between the wealth ratios $GROSSWEALTHB_{it}$ $NETWEALTHB_{it}$ $STOCKWEALTHB_{it}$ as well as $GROSSWEALTHM_{it}$ $NETWEALTHM_{it}$ and $STOCKWEALTHM_{it}$ are significantly positive. In addition, the wealth ratios correlate with fractional ownership variable $OWNERSHIP_{it}$ as expected, but the levels of the correlation coefficients are relatively low ranging from 0.185 to 0.320 for market-based wealth ratios and from 0.233 to 0.304 for book-value based. Out of the wealth ratios $NETWEALTHM_{it}$, $NETWEALTHB_{it}$ and $STOCKWEALTHB_{it}$ exhibit low and weak correlation with the dependent variable $OPER\_PERF_{it+1}$, whereas fractional ownership is not correlated with future performance at all. Correlation between similarly defined market-value based and book-value based wealth ratios is significant and high (up to 0.945 for ratios based on stock wealth and total wealth), suggesting that book-value based ratios represent a good proxy for the fraction of CEO's wealth invested in her firm for empirical testing. Correlations between the ownership variables and $LOGSALES_{it}$ are negative consistent with the fact that both fraction of the firm own by a CEO and percentage of her total wealth invested in the firm decrease with firm size. Significantly negative correlation coefficients between ownership variables and net purchasing ratio indicate that higher levels of wealth ratios as

well as of value of a company owned by a CEO are associated with stock sales. This could be explained by diversification motives of insiders. In our data CEOs of bigger firms buy more than sell, as the correlation between $LOGSALES_{it}$ and NPR_{it} equals to 0.716. In addition positive correlation coefficient between $LOGSALES_{it}$ and $DEBT\_RATIO_{it}$ shows that larger firms have more debt in the capital structure.

 (Insert Table 3 about here)

4. Empirical results

4.1. Effect of the CEO ownership as a fraction of her total wealth and as a fraction of the firm's on the future accounting profitability of the firm.

Table 4 reports the results of regressing future operating return on assets on different measures of CEO's ownership. The standard errors are clustered by firm to take into account residual dependence created by firm effect, as suggested by Petersen (2009).

The estimated parameters for both market-value based and book-value based wealth ratios are significantly positive. In other words, the greater is the proportion of a CEO's personal wealth tied to her firm, the better is the profitability of the firm. This result is consistent with our hypothesis that a CEO's incentives and resulting profitability of the firm increase with the proportion of her personal wealth invested in her firm. The results are the strongest for the $GROSSWEALTHM_{it}$ ($GROSSWEALTHB_{it}$) variables, consistent with the fact that total outside wealth represents the best measure to scale CEO's ownership and to determine performance consequences of her incentives.

The results also show that CEO's ownership as a fraction of the shares of her firm ($OWNERSHIP_{it}$) is significantly related to the future profitability of the firm. Due to the relatively low correlations between the variables $GROSSWEALTHM_{it}$ ($GROSSWEALTHB_{it}$) and $OWNERSHIP_{it}$ reported in Table 3, we also estimated Model (1) by using these two variables in the model at a time. The parameter estimates for the variables decreased, but remained significant in both specifications. In other words, both CEO's fractional ownership and proportion of wealth invested into the firm explain one-year ahead operating performance. Surprisingly, coefficient on NPR_{it} is significantly negative, unlike documented in previous studies (Piotroski and Roulstone, 2005). Coefficients on size and leverage proxies and significantly positive and negative, respectively.

All in all, the results reported in Table 4 support our view that a CEO's equity incentives should be assessed by comparing her ownership in the firm to her personal wealth.

(Insert Table 4 about here)

4.2. Robustness checks and additional analyses

For a sensitivity check we use other levels of future accounting profitability, namely net income and income before interest and tax scaled with total assets as a dependent variable. The results for wealth ratios remain significantly positive, however, the magnitude of the parameter estimates drops. Possible reason for this could be that operating profit reflects CEO's effort better than other profit levels. The results are also robust to usage of

logarithmic market value and logarithmic total assets as proxies for size as well as to exclusion of bank and insurance companies (SIC codes 6000-6499).

Prior research suggests that measurers of operating performance are persistent over time (Fama and French, 2000). One way to control for this issue is to include current operating profitability as a dependent variable into the regression of future profitability. However, this control variable is likely to absorb the impact of the wealth ratio we are trying to estimate. To cope with the possible autocorrelation among yearly profitability observations, we calculate mean values of dependent and independent variables over the sample period and estimate the Model (1) by using these averages. These results are reported in Table 5. The parameter estimates for wealth ratios stay quantitatively similar to those reported earlier with the exception of $STOCKWEALTHM_{it}$. The reason for insignificant parameter estimate of this ratio can be its dependence on price volatilities of different companies. In respect to fractional ownership variable the results of mean values regression do not hold.

(Insert Table 5)

In addition, we estimate Model (1) by using the Fama-MacBeth yearly regressions approach. Specifically, we estimate Model (1) for each year in our sample period and calculate the time-series averages of the estimated parameters from the cross-sectional regressions. These results for wealth ratios estimates are qualitatively similar to those reported in the tables.

As a further specification check we estimate Model (1) for the sample, where CEO's fractional ownership is less than 5%. Prior studies have estimated a piecewise regression of performance on fractional ownership (Morck, Shleifer and Vishny, 1988) with inflection points of 5% and 25%. In addition, firms with low CEO's fractional ownership constitute a major part of our data. Thus, after exclusion of firms in which CEO is a block holder, owning more than 5% of the firm value, the sample reduces by 17% to 1090 observation. We also believe that this specification helps to determine an incremental incentive effect of the wealth ratio over the proportion of the firm hold by CEO. The results remain significantly positive for $GROSSWEALTHM_{it}$, $GROSSWEALTHB_{it}$ and $NETWEALTHB_{it}$. The parameter estimates for CEO's fractional ownership on future operating profitability in the interval from 0 to 5% in our sample are insignificant, contrary to principal-agent alignment hypothesis (Morck, Shleifer and Vishny, 1988). This indicates that significantly positive results of $OWNERSHIP_{it}$ variable on future operating performance reported earlier are driven by the firms, in which CEO is a monitoring shareholder.

5. Concluding remarks

In this paper, we explore whether the proportion of CEO's total personal wealth invested in her firm increases her incentives and, consequently, the profitability of the firm. We hypothesize that the incentive effect of the CEO ownership increases with the fraction of her personal wealth invested in her firm and contribute to literature on the incentive effects of the managerial equity ownership by evaluating the CEO equity ownership relative to her total wealth.

We employ a unique dataset on the personal wealth of the CEOs' of the listed Swedish firms including CEOs' holdings in their insider and outsider stocks and their other wealth. Our empirical results show that there is a significantly positive relation between a share of CEO's personal wealth invested into the firm and the future profitability of the firm. These results are robust to a number of specification checks. In addition, a re-examination of CEO's fractional ownership effect on future performance does not provide stable results. To sum up, scaling the value of CEO shares with her outside wealth can provide a more appropriate measure of incentives than the traditional measure, especially in firms, where CEOs own tiny fractions.

There are several limitations in our study. First, our analysis is restricted to incentives generated by shareholding. We admit that monetary incentives coming from the options, and salary could affect performance in a more complicated way. We exclude options from the analysis because the data for calculating the values of options is not available for Swedish companies. In addition, given the exercise price of options, their incentives are related more to stock performance than to accounting performance, which we analyse in this paper. We also exclude incentives generated by the variable component of salary, because we believe that it has a short-term effect and results rather in current period earnings management than in long-term enhancement of performance.

Second, we do not analyse origin of CEO's shareholding, namely, whether they were bought in the open market, granted by the firm or acquired through the option exercises. Determining incentive effect of shares awarded by the firm, would be most beneficial for investors. We hope that controlling for trade behaviour of CEOs at least partially disentangles effects of bought and granted shares.

Third, CEO's sophistication is a possible factor, which could result in better performance. However, we do not believe that omission of CEO's skill would create endogeneity in our model. Other things equal, a more sophisticated CEO would have more outside wealth, as a result of her prior high earnings. Firms run by more sophisticated CEOs would perform better and the value of their holdings would be higher because of anticipated higher performance. Because wealth ratio equals to CEO's ownership divided by the CEO's outside wealth, CEO's skill is unlikely to affect it given higher level of both numerator and denominator for more sophisticated CEOs.

Finally, we do not incorporate risk into our model. In our data wealth of some CEOs consist barely from the holdings in their firms. We do not discuss alternative outcomes of actions of undiversified CEOs on the performance of the company.

Our paper opens a fruitful area for future research. Even though managerial outside wealth information is usually unavailable, researchers could construct proxies of insider wealth (e.g. similar to Liu and Yermack, 2007; Bitler, Moskowitz and Vissing-Jorgensen) to better investigate effect of managerial wealth proportion invested into the firm on the effort and firm performance. In particular, it would be interesting to research this effect in different institutional settings, for instance, using data from the United States.

Appendix. Description of variables.

	Variable	Description
Dependent variable	$OPER\_PERF_{it+1}$	Operating profit divided by the lagged total asset for firm i in year $t+1$.
Test variables	$GROSSWEALTHM_{it}$	Market value of CEO's holdings in her firm i divided by the value of her total wealth (the market value of her holdings in all insider and outsider stocks and the value of her other wealth) in the end of year t.
	$NETWEALTHM_{it}$	Market value of CEO's holdings in her firm i divided by the value of her total net wealth (the market value of her holdings in all insider and outsider stocks and the value of her other wealth minus her debt) in the end of year t.
	$STOCKWEALTHM_{it}$	Market value of CEO's holdings in her firm i divided by the value of her all stock holdings (the market value of her holdings in all insider and outsider stocks) in the end of year t.
	$GROSSWEALTHB_{it}$	Book value of CEO's holdings in her firm i divided by the value of her total wealth (the book value of her holdings in her firm, the market value of her outsider stocks and the value of her other wealth) in the end of year t.
	$NETWEALTHB_{it}$	Book value of CEO's holdings in her firm i divided by the value of her total net wealth (the book value of her holdings in her firm, the market value of her outsider stocks and the value of her other wealth minus her debt) in the end of year t.
	$STOCKWEALTHB_{it}$	Book value of CEO's holdings in her firm i divided by the value of her all stock holdings (the book value of her holdings in her firm, the market value of her outsider stocks) in the end of year t.

	$OWNERSHIP_{it}$	market value of CEO's holdings in her firm i divided by the market value of firm j in the end of year t.
Control variables	$LOGSALES_{it}$	Natural logarithm of the i firms's sales for the year t.
	$DEBT\_RATIO_{it}$	Firm's i total debt divided by total assets at the end of t.
	NPR_{it}	Net-purchasing ratio of a CEO's open market purchases and sales of the stocks of her firm dividing the number of stocks she has purchased during year t minus the number of stocks she has sold during year t by the total number of the stocks she purchased and sold during year t.

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Table 1.

Summary statistics on CEOs' personal taxable income and wealth

	Mean	Median	Min	Max
Value of stockholdings in own firm	56,264	1,711	1	10164,944
Value of other stockholdings	6,234	170	0	1314,177
Gross value of other wealth	19,107	2,392	0	2292,211
Net value of other wealth (debt deducted)	16,548	1,046	-40,746	2287,482
Annual taxable income	2,723	1,869	0	43,437

Notes:

Annual taxable income and the values of stockholdings and other wealth are in thousands of SEK. 1 SEK is equal to 0.14 USD.

Table 2.

Descriptive statistics of the key variables used in the regressions

Variable	Mean	Median	Standard deviation	Min	Max
$OPER\_PERF_{it+1}$	0.015	0.048	0.230	-1.367	1.538
$OWNERSHIP_{it}$	0.037	0.002	0.090	0	0.675
$GROSSWEALTHM_{it}$	0.530	0.505	0.368	0	1
$NETWEALTHM_{it}$	0.579	0.598	0.605	-12.502	6.937
$STOCKWEALTHM_{it}$	0.763	0.927	0.300	0.001	1
$GROSSWEALTHB_{it}$	0.447	0.340	0.376	0	1
$NETWEALTHB_{it}$	0.506	0.414	0.575	-4.033	7.155
$STOCKWEALTHB_{it}$	0.693	0.856	0.339	0	1
$LOGSALES_{it}$	6.502	6.596	2.410	-2.019	11.676
$DEBT\_RATIO_{it}$	0.188	0.152	0.180	0	0.733
NPR_{it}	0.167	0	0.497	-1	1

Notes:

The table reports summary statistics of variables in the empirical analysis comprising 1,308 observations. All variables are as defined in Appendix.

Table 3.

Pearson correlations among the key variables.

	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) *OPER_PERF$_{it+1}$*	0.013 (0.630)	0.007 (0.811)	0.010 (0.722)	**0.047 (0.091)**	0.013 (0.649)	**0.050 (0.071)**	**0.050 (0.073)**	**0.410 (0.000)**	**0.074 (0.008)**	-0.014 (0.607)
(2) *OWNERSHIP$_{it}$*		**0.320 (0.000)**	**0.185 (0.000)**	**0.238 (0.000)**	**0.304 (0.000)**	**0.233 (0.000)**	**0.251 (0.000)**	**-0.195 (0.000)**	**-0.065 (0.018)**	**-0.137 (0.000)**
(3) *GROSSWEALTHM$_{it}$*			**0.598 (0.000)**	**0.672 (0.000)**	**0.945 (0.000)**	**0.601 (0.000)**	**0.650 (0.000)**	**-0.250 (0.000)**	0.018 (0.508)	**-0.098 (0.000)**
(4) *NETWEALTHM$_{it}$*				**0.428 (0.000)**	**0.558 (0.000)**	**0.554 (0.000)**	**0.416 (0.000)**	**-0.151 (0.000)**	-0.017 (0.549)	-0.040 (0.147)
(5) *STOCKWEALTHM$_{it}$*					**0.616 (0.000)**	**0.438 (0.000)**	**0.945 (0.000)**	**-0.077 (0.005)**	0.002 (0.951)	**-0.058 (0.037)**
(6) *GROSSWEALTHB$_{it}$*						**0.631 (0.000)**	**0.668 (0.000)**	**-0.232 (0.000)**	**0.070 (0.012)**	**-0.080 (0.003)**
(7) *NETWEALTHB$_{it}$*							**0.476 (0.000)**	**-0.137 (0.000)**	0.034 (0.216)	**-0.06 (0.030)**
(8) *STOCKWEALTHB$_{it}$*								**0.077 (0.005)**	0.039 (0.163)	**-0.074 (0.008)**
(9) *LOGSALES$_{it}$*									**0.300 (0.000)**	**0.716 (0.010)**
(10) *DEBT_RATIO$_{it}$*										0.159 (0.565)
(11) *NPR$_{it}$*										

Notes:

The table reports correlations among variables in used in the tests. All variables are as defined in Appendix.

Table 4.

Results of regressing the future operating performance of the firm (*OPER_PERF$_{it+1}$*) on the fraction of CEO's outside wealth invested into her firm and on CEO's fractional ownership.

Variable	Expected sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)
INTERCEPT	?	**-0.189** **(0.004)**	**-0.179** **(0.007)**	**-0.150** **(0.012)**	**-0.180** **(0.007)**	**-0.169** **(0.010)**	**-0.159** **(0.007)**	**-0.207** **(0.016)**
GROSSWEALTHM$_{it}$	+	**0.072** **(0.004)**						
STOCKWEALTHM$_{it}$	+		**0.058** **(0.079)**					
NETWEALTHM$_{it}$	+			**0.025** **(0.049)**				
GROSSWEALTHB$_{it}$	+				**0.068** **(0.006)**			
STOCKWEALTHB$_{it}$	+					**0.055** **(0.064)**		
NETWEALTHB$_{it}$	+						**0.042** **(0.009)**	
OWNERSHIP$_{it}$	+							**0.255** **(0.034)**
NPR$_{it}$	?	**-0.025** **(0.074)**	**-0.027** **(0.063)**	**-0.028** **(0.053)**	**-0.026** **(0.068)**	**-0.027** **(0.051)**	**-0.026** **(0.065)**	-0.023 (0.105)
LOGSALES$_{it}$	?	**0.042** **(0.000)**	**0.039** **(0.000)**	**0.040** **(0.000)**	**0.042** **(0.000)**	**0.039** **(0.000)**	**0.040** **(0.000)**	**0.041** **(0.000)**
DEBT_RATIO$_{it}$	?	**-0.169** **(0.001)**	**-0.155** **(0.002)**	**-0.154** **(0.002)**	**-0.173** **(0.001)**	**-0.158** **(0.002)**	**-0.162** **(0.002)**	**-0.150** **(0.004)**
Yearly dummy variables		Included	Included	Included	Included	Included	Included	Included
Industy dummy variables		Included	Included	Included	Included	Included	Included	Included

Adj R-square	0.232	0.226	0.224	0.231	0.226	0.231	0.229
N	1308	1308	1308	1308	1308	1308	1308

Notes:

The table reports results of estimating Model (1). All variables are as defined in Appendix. The t-statistics are based on heteroscedasticity robust firm level clustered standard errors as suggested by Petersen (2009).

Table 5.

Results of regressing the mean one-year-ahead operating performance of the each firm in the sample on the mean fraction of CEO's outside wealth invested into her firm and on the mean CEO's fractional ownership.

Variable	Expected sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)
INTERCEPT	?	**-0.236** **(0.093)**	-0.234 (0.105)	**-0.235** **(0.090)**	-0.227 (0.103)	-0.222 (0.116)	-0.207 (0.135)	-0.234 (0.111)
GROSSWEALTHM$_{it}$	+	**0.089** **(0.022)**						
STOCKWEALTHM$_{it}$	+		0.076 (0.115)					
NETWEALTHM$_{it}$	+			**0.089** **(0.006)**				
GROSSWEALTHB$_{it}$	+				**0.089** **(0.020)**			
STOCKWEALTHB$_{it}$	+					**0.073** **(0.088)**		
NETWEALTHB$_{it}$	+						**0.059** **(0.029)**	
OWNERSHIP$_{it}$	+							0.217 (0.187)
NPR$_{it}$	?	**-0.068** **(0.093)**	**-0.072** **(0.077)**	**-0.074** **(0.066)**	**-0.069** **(0.087)**	**-0.071** **(0.083)**	-0.066 (0.104)	-0.067 (0.107)
LOGSALES$_{it}$	?	**0.041** **(0.000)**	**0.039** **(0.000)**	**0.041** **(0.000)**	**0.041** **(0.000)**	**0.039** **(0.000)**	**0.040** **(0.000)**	**0.040** **(0.000)**
DEBT_RATIO$_{it}$	?	**-0.201** **(0.011)**	**-0.184** **(0.020)**	**-0.189** **(0.016)**	**-0.205** **(0.001)**	**-0.186** **(0.019)**	**-0.196** **(0.013)**	**-0.174** **(0.028)**
Industy dummy variables		Included	Included	Included	Included	Included	Included	Included
Adj R-square		0.247	0.238	0.254	0.247	0.240	0.245	0.224

N	259	259	259	259	259	259	259

Notes:

The table reports results of estimating Model (1) for mean values of variables over the sample period. Firms with one year observation are deleted. All variables are as defined in Appendix.