

Holding On For Good Times: The Information Content of CEOs' Voluntary Equity Exposure

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ABSTRACT

We present a novel idea for extracting information about future stock performance from the *level* of equity exposure of the CEO that is not conveyed by her purchases and sales. A high level of equity exposure, when it reflects the CEO's own choice, is associated with 5% to 9% positive abnormal returns over the next year. This relation holds after controlling for purchases by the CEO and is stronger for firms where she has a greater information advantage. We rule out possible alternative explanations based on unobserved firm characteristics, missing risk factors, and incentive of the CEO to exert effort.

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I. Introduction

Trades by top managers of firms receive a lot of attention from investors, financial media, as well as regulators since the top managers have privileged access to information about future performance of the firm. Consequently, a sizeable academic literature examines whether trades by top managers are informative about future firm performance and studies abnormal equity returns after purchases and sales by them of their own stock (e.g., Seyhun (1986, 1998), Lakonishok and Lee (2001)). In contrast, in this paper we provide a novel idea for extracting information about future stock performance from the *level* of equity exposure of the CEO that is not conveyed by purchases and sales. We show that firms where CEOs themselves *choose* to have a high *level* of equity exposure have abnormal returns of about 7% over the next year, relative to other firms.

We argue that the *level* of equity exposure of the CEO is likely to have information about future performance in addition to purchases and sales that have typically been examined in the insider trading literature. For example, when a CEO sells some stock from her portfolio, this is unlikely to signal underperformance if she has large stock holdings even after the sale. On the other hand, when a CEO purchases stock in spite of having a large exposure, it probably reflects stronger views about future positive performance relative to a purchase of similar size when the CEO has no pre-existing equity exposure. In fact, in a simple Merton (1969) framework, beliefs about future stock performance at any point in time (i.e., expected returns or *alpha*) ought to be reflected in the *level* of stock holdings of the agent at that point. Purchases and sales ought to reflect *changes* in such beliefs.

A stock sale could be due to the CEO's view changing from very positive to a little less positive.¹ Similarly, a CEO who consistently believes that the stock will have positive abnormal performance would hold a large quantity of stock in her portfolio and would not trade. This is especially true if the CEO knows that the firm is undervalued but does not know *when* the valuation is going to be corrected by the market. Alternatively, if the CEO thinks that the firm is likely to do well in a couple of years, she might slowly build up equity exposure to her firm over time. In this case each individual purchase decision may not be informative, but when taken together the resultant high level of exposure is informative about future stock performance. The above arguments motivate us to examine whether the *level* of equity exposure of the CEO has information about future stock performance.

Not all types of equity exposure are likely to be informative about future stock performance. This is because CEOs typically receive stock and option grants as a part of their compensation package. Therefore, a high level of equity exposure can sometimes simply be a result of such grants from the firm and not reflect her own choice. To extract CEO's beliefs about good future firm performance one needs to identify situations when the CEO herself chooses to have a high equity exposure level.

Our approach to assessing whether the observed equity exposure reflects the choice of the CEO is based on a simple idea. When the CEO has *some* equity exposure that is clearly voluntarily, then her *entire* equity exposure, including the part that is forced on her, reflects her chosen exposure level. In other words, if the marginal stock in her portfolio is voluntarily held, then the entire equity exposure

¹ Scott and Xu (2004) find some evidence of this. They find that when an insider has high stock holdings after a sale, the transaction is followed by *positive* abnormal stock returns.

reflects the chosen exposure level of the CEO. This is because if the desired exposure level were lower, she could sell some of her voluntarily held stock. On the other hand, if the desired exposure level were higher, she could simply purchase more stock.

Any assessment of whether the CEO has any voluntary exposure to the firm is necessarily imperfect for a number of reasons. CEOs are not allowed to trade all the time, since they are subject to blackout period restrictions and short-swing profit rules. This may hinder their reaching the desired equity exposure level to their firm's equity in their portfolio. Moreover, they may not continuously monitor their portfolios, and even if they did, fixed transaction costs can make continuous rebalancing suboptimal. Furthermore, the firm might impose implicit and explicit stock holding requirements (in addition to equity exposure through restricted stocks and options), which are not always observable to the empiricist. However, one can obtain a proxy for whether the CEO has any equity exposure to her firm that is clearly voluntary.

We use the ratio of value of unrestricted stock held to the total equity exposure of the CEO as a proxy for this. This ratio should be positively related to the likelihood of the CEO's consciously choosing to have some additional equity exposure over and above what is forced due to equity based compensation. In particular, we empirically identify CEOs who *choose* to have a *high* equity exposure level as those that satisfy two conditions: a) the ratio of unrestricted stock holdings to her total equity exposure is in the top quartile among all CEOs for that year, and b) the total equity exposure (appropriately scaled) is in the top quartile for that year. We refer to such CEOs throughout the paper as having a high voluntary exposure level or, alternatively, a high desired exposure level.

Using a calendar time methodology, we find that an equally weighted portfolio of firms for which the CEO has high voluntary exposure level earns monthly abnormal returns of 0.61% to 0.73% over the next year, relative to other firms, while a value-weighted portfolio earns 0.42% to 0.47% monthly abnormal returns. This suggests that the level of a CEO's equity exposure, when it reflects her own choice, has valuable information about the firm's future performance that is not completely reflected in the stock prices. In a regression framework, we find that the above results are robust to a variety of specifications, which we elaborate on later.

Since CEOs of larger firms are likely to be wealthier, the same dollar amount of stock holding is likely to represent a smaller fraction of their wealth. Therefore, total equity exposure in dollars needs to be appropriately scaled before it is possible to compare the measure across CEOs. We use a number of scaling methods and find that all of them give very similar empirical results. Further, we verify that the relation between a CEO's voluntarily chosen exposure level and future returns holds in a cross-sectional regression setting, where the dependent variable is the characteristic adjusted abnormal returns (calculated using a method similar that in to Daniel et. al. (1997)). In this setting we are able show that our results hold even after controlling for various firm and CEO characteristics.

A possible concern could be that our results simply reflect the pattern that CEO purchases are followed by positive abnormal returns, which has been documented by studies on insider trading (Jaffe (1974), Seyhun (1986, 1998), Rozeff and Zaman (1998a, 1998b), Lakonishok and Lee (2001)). However, we find that high voluntary equity exposure is related to high future abnormal returns,

even after controlling for net stock purchase during the fiscal year. Further, the literature on insider trading typically find abnormal returns over a few days following the purchase, while, the window over which we examine returns starts at least four months after the point in time when the equity exposure level is measured.²

An alternative explanation for our result could be that high equity exposure induces higher effort, which in turn leads to higher future returns. If this were the case, we should see positive abnormal returns when CEOs have high equity exposure, irrespective of whether the exposure is voluntary or not. However, if future abnormal returns are due to information, high equity exposure would forecast good stock performance only when the exposure is voluntary, but not otherwise. We find that while high voluntary equity exposure (i.e., unrestricted stock holdings) is related to future returns, high forced equity exposure (i.e., due to restricted stock and options) is not. Further, if our basic results are driven by information, they ought to be stronger for firms where the CEO is likely to have a greater information advantage. In support of this, we find that the relation between high desired exposure level of the CEO and future returns is stronger for smaller, younger, high volatility, negative profitability, non-dividend-paying firms, and firms with a high dispersion of analyst forecasts.

While we control for observed CEO and firm characteristics in our regressions, it is possible that some unobserved characteristics or unobserved risk factors could drive our results. For example, if CEOs of firms with certain unobserved characteristics are more likely to hold equity of their firm

² We leave this gap to ensure that all information that we used to identify whether the CEO has high voluntary equity exposure is publicly available before the beginning of the period over which we examine the abnormal returns.

voluntarily and these firms also have a high exposure to a risk factor that we do not account for, this could give rise to the empirical relationship we observe. We provide a number of pieces of evidence suggesting that this is not the case. We study how long the abnormal returns persist and find that a high voluntary exposure is followed by significant positive abnormal returns only for one to two years in the future. The abnormal returns drop significantly in the second year and are statistically indistinguishable from zero from the third year onward. If returns were related to a persistent unobserved characteristic or loading on a risk factor, we would expect abnormal returns to persist for longer.

While long-run abnormal return calculations are subject to criticisms of not being able to appropriately correct for exposure to risk factors, abnormal returns measured over short windows suffer much less from such concerns. Therefore, we examine abnormal returns around a three-day window around earnings announcements. For firms with high voluntary exposure of the CEO, we find that earnings announcements in the following year are associated with 0.35% to 0.44% higher abnormal returns over a three day window, relative to other firms. This provides further evidence that high voluntary exposure of the CEO is motivated by information, part of which is revealed to the market at future earnings announcements.

Overall, our paper provides strong evidence that a high level of equity exposure of the CEO, when it is a result of her own choice, is indicative of future positive stock price performance. This provides at least a partial explanation for the seemingly puzzling observation that many CEOs seem to hold large amounts of their own company stock voluntarily in spite of the fact that it makes their

portfolios undiversified and exposes them to the idiosyncratic risk of the stock.³ Further, our results are likely to be of interest to regulators interested in designing appropriate regulations and disclosure rules pertaining to trading by corporate insiders, shareholders and corporate boards interested in creating optimal incentive structures, and market participants interested in profitable trading strategies.

The rest of the paper is organized as follows. The next section describes how our paper is related to prior literature. Section II presents our data and methodology of analysis. Our empirical results are presented in Section III. Section IV concludes with a summary.

I. Relation to previous literature

A large literature examines whether purchases and sales of stock by insiders are related to future stock price performance. Early studies focusing on abnormal returns around insider purchases and sales found that they were informed transactions (Seyhun (1986, 1992, 1998)). Later studies that controlled for return on stocks with similar characteristics found that informed transactions seem limited to insider purchases at smaller firms (Jeng, Metrick and Zeckhauser (2003), Lakonishok and Lee (2001)). Jenter, Lewellen and Warner (2011) show that managers have the ability to time the market by looking at evidence from the timing of put option sales by 137 large firms. They find that managers are able to time positive stock price movements over the next six months. More recently,

³ In our data, over the period 1994 to 2006, the median CEOs of an S&P 1500 firm had about 50% of the exposure to their own company due to unrestricted stock.

Cohen et al. (2012) find that both insider purchases and sales have information when one eliminates routine trades by insiders and focuses on the rest. In sum, the insider trading literature has focused on the information content of buys and sells by the insiders. In contrast, we show that the *level* of holdings has additional information about future stock price movements.

Our study is also related to the literature on the relation between managerial ownership and firm performance. Morck, Shleifer, and Vishny (1988) show that Tobin's Q increases with holdings when managers hold from 0-5% of the outstanding stock, decreases as ownership rises to 25%, and then begins to rise after 25%. McConnell and Servaes (1990) also find a similar non-linear relation between Tobin's Q and managerial ownership. Additionally, Mehran (1995) finds that firm performance is positively related to the proportion of executive compensation that is stock-based and the fraction of equity held by management. In contrast, Himmelberg, Hubbard and Palia (1999) find little evidence that changes in managerial ownership affect performance, after controlling for firm fixed effects. While the above papers measure firm performance through Tobin's Q or accounting performance, we examine stock price performance. Examining the relation between CEO holdings and future returns suffers from reverse causality concerns to a lesser extent than examining the relation between Tobin's Q and accounting performance. Further, examining returns allows us to control for risk exposure. A recent working paper by Cooper, Gulen, and Rau (2011) examines the effect of compensation on future stock price performance. However, they focus on the proportion of total annual compensation that is equity based. In contrast, we examine the extent of equity exposure that the CEO voluntarily chooses to have. While these seem to be related, they may be quite different. For example, an executive can have a large equity exposure in a year when

her equity-based compensation is not high, if she has purchased stock on her own or has restricted stocks and options from previous years. Furthermore, differentiating between whether the exposure is voluntarily chosen or forced on the CEO is something unique to our study, which is not considered in any of the above studies.

II. Data and Methodology

We obtain information about equity-related exposure of the CEO from the Execucomp database of Compustat. This database has information on restricted stocks, unrestricted stock holdings, and intrinsic value of option holdings aggregated by whether they have vested or not. The sample for our study is the set of firms covered by the above database for the fiscal years 1994 to 2006. We obtain other balance-sheet and accounting-statement-related variables for these firms from Compustat. Stock returns are obtained from the Center for Research in Security Prices (CRSP) database. Analyst-related information and dates of earnings announcement are collected from I/B/E/S. Data on governance indices, G-Index and E-Index, are obtained from the websites of Prof. Andrew Metrick and Prof. Lucian Bebchuk respectively.

We define total equity exposure as the sum of the value of unrestricted stocks, restricted stocks, and the product of share price and total delta of all options, measured at the fiscal year end. Since information on individual option series is not available in Execucomp, we follow a method similar to that in Core and Guay (2002) to approximate the total delta of all options held. Specifically, our

method parallels the measurement of the variable B^{III} described in Appendix B of Edmans, Gabaix and Landier (2009).

We consider unrestricted stock holdings as exposure that is voluntarily taken by the CEO, since they can be immediately converted to cash. Some of the vested options can perhaps be thought as contributing to voluntary exposure since a vested in-the-money option can be exercised immediately to obtain its intrinsic value in cash. However, one would have to forgo its time value by exercising early. Therefore, unlike in the case of unrestricted stock, obtaining the intrinsic value from the option immediately involves a cost and we consider only unrestricted stock holdings as purely voluntary equity exposure.

In each year we sort all firms by the ratio of voluntary equity exposure to total equity exposure into quartiles. For the purposes of sorting firm by year by any variable, we define *sorting year t* as fiscal year end dates between March of calendar year t and February of calendar year $t+1$. For example, the data for fiscal years that end between 1 March 1995 and 29 February 1996 are considered in to be in the same sorting year viz., 1995. The variable *High Voluntary Proportion Dummy* is defined to be 1 for the firms in the top quartile in a sorting year and zero for the rest. These are the cases where the total equity holdings very likely represent the level of equity exposure voluntarily chosen by the CEO.

For our study, theoretically it is important to scale the level of total equity exposure such that it becomes comparable across CEOs of different firms. Since CEOs of larger firms are likely to be wealthier, the same dollar amount of stock holding is likely to represent a smaller fraction of their

wealth. Our main measure is the residual of the regression of the logarithm of total equity exposure on the logarithm of firm size, industry dummies, and year dummies. We call this the *abnormal total equity exposure*. It is essentially the logarithm of the ratio of actual equity exposure to that predicted by the regression model. Edmans, Gabaix and Landier (2009) provide theoretical motivation supporting the use of this regression model as the benchmark equity exposure. Furthermore, they find that empirically, the explanatory power of this model seems to be quite high, suggesting that the fitted value from this model is a good comparison benchmark for total equity exposure, even if one does not believe that the model captures CEO wealth well. For each sorting year (as defined earlier), we define the variable *High Voluntary Abnormal Exposure Dummy* to be 1 for firms that are in the top quartile by abnormal total exposure as well as in the top quartile by ratio of voluntary equity exposure to total equity exposure. These firms are the ones where CEOs have a high equity exposure, which also likely represents their voluntary choice.

One concern with the above measure might be that the measure is based on parameter values that are estimated from the data. Therefore, we use other choices of scaling of total equity exposure to convince the reader that our results are not an artifact of the choice of the scaling variable. Our first alternative is to use the total equity exposure in dollars, without any kind of scaling. In each sorting year, firms that are in the top quartile by this measure and have *High Voluntary Proportion Dummy* equal to 1, have the variable *High Voluntary \$ Exposure Dummy* set to 1 (and 0 otherwise).

Our second alternative is to use another version of scaling by firm size that does not rely on estimating any parameters from the data. Edmans, Gabaix and Landier (2009) show that in a talent

assignment model like that in Gabaix and Landier (2008), the dollar value of stock and option holdings should be proportional to the product of the size of the firm to the power $1/3$ and the size of a reference firm in the economy to the power $2/3$. They find empirical support for this hypothesis. Motivated by this, we define scaled equity exposure as total equity exposure divided by the product of own firm size to the power $1/3$ and reference firm size to the power $2/3$. Own firm size is the sum of the book value of debt and the market value of equity and the reference firm size is the size of the 250th ranked firm from the S&P 500. We also use this measure, which we call scaled equity exposure, in all our empirical tests. Using this variable, in a manner similar to the other alternative measure, we define *High Voluntary Size-Adjusted Exposure Dummy*.

Dittman and Maug (2007) estimate the wealth of the CEO based on salary, stock grants, and stock option grants and exercises by the CEO after entering the ExecuComp sample.⁴ This estimate does not account for the wealth of the CEO before entering the ExecuComp database, assumes that all cash obtained by the CEO was invested in the risk-free asset, and everything is saved i.e., there is no spending or consumption. In spite of these shortcomings, we think that this is a reasonable proxy for the true wealth of the CEO. Our third alternative uses this measure of wealth to scale the total equity exposure of the CEO. Using this, similar to the other alternative measures, we define the dummy variable: *High Voluntary Wealth-Scaled Exposure Dummy*.

Finally, if we assume that the CEO's wealth is proportional to the total compensation received in the previous year, then dividing total equity exposure by total compensation (tdc1 variable of

⁴ Further details are available at http://people.few.eur.nl/dittmann/documentation_of_wealth_estimate.pdf. We thank Ingolf Dittman for making the CEO wealth estimate data available on his website.

Execucomp) is another possible method for scaling of total equity exposure. We use this measure of scaled equity to define *High Voluntary Compensation Adjusted Exposure Dummy*.

Table 1 presents the summary statistics for the above variables and some other variables that we include as controls in regressions. We note that the mean and median of (% stock holding/total holding) for CEOs are 51% and 50% respectively. Therefore, a substantial fraction of the CEOs seem to have large voluntary equity exposures to the equity of their firms.

To study the relation between a variable observed at the firm level and future equity returns, we use two empirical strategies. The first is to sort stocks into groups every June, based on the variable of interest. Our definition of the sorting year ensures that we use only information corresponding to the fiscal years that end before the February of that year. Since firms typically file proxy statements and 10-K statements within four months of the fiscal year-end, all information should be publicly available as of June. Next, we calculate the average future abnormal returns of these quartile portfolios from July to next June. We then test whether the difference in abnormal returns between the portfolios representing different groups of stocks is significant, using a calendar time portfolio method (Lyon, Barber, and Tsai (1999)). Abnormal returns are *alphas* from a regression of raw returns on the Fama-French-Carhart four factors, as well as from regressing characteristic-adjusted returns on the four factors.⁵ The characteristic adjusted returns are calculated as returns on a portfolio of stocks with similar size, book-to-market, and momentum characteristics (similar to

⁵ This data was obtained from the website of Prof. Ken French.

Daniel et al. (1997) and Jeng et al. (2003)). The exact procedure for assigning stocks into bins is described in Appendix A.

A calendar time method does not easily allow us to control for the possible effects of other variables on future stock returns. Moreover, it is difficult to examine the effect of the interaction of two variables on future returns. Therefore, we also conduct our tests in a panel regression framework. Characteristic-adjusted monthly abnormal returns from July to June are regressed on variables of interest, which are calculated using information publicly available before the start of the return measurement period. Standard errors are clustered by calendar year-month to correct for correlation in abnormal returns of different firms in the same period. All our regressions include year-month fixed effects.

III. Empirical Results

A. Calendar Time Portfolio Results

To test our hypothesis that CEOs with relatively high voluntary equity exposure should predict future abnormal returns, we sort firms into groups based on the dummy variables defined earlier. These indicator variables are 1 when two conditions hold: a) the ratio of unrestricted stock holdings to the CEO's total equity exposure is in the top quartile for that sorting year, and b) the total equity exposure (appropriately scaled) is also in the top quartile among all CEOs in that sorting year. Table

II reports calendar time abnormal returns for two portfolios: firms with high CEO voluntary exposure, and the remaining firms. Panel A of the table presents results for characteristic adjusted returns regressed on the four Fama-French factors, while Panel B presents results for raw returns regressed on the four factors.⁶ We present results for equally-weighted as well as value weighted returns. Overall we find that firms where the CEO voluntarily has a high equity exposure earn abnormal returns have a higher return than the remaining firms. The difference in characteristic and factor adjusted abnormal returns across the two equally-weighted portfolios ranges from 0.61% to 0.86% per month. Using our main variable *High Voluntary Abnormal Exposure Dummy*, yields an abnormal returns of 0.73% for the long-short portfolio. This translates into an annual abnormal return of 8.76%. When the portfolios are value-weighted, the abnormal return for the long-short portfolio is a little lower and ranges between 0.42% and 0.52% per month. This translates to a 5.04% to 6.24% annual abnormal return. The results are similar when we use raw returns instead of characteristic adjusted returns where we correct for loadings on the four factors to calculate abnormal returns.

B. Multivariate Regression Results

The calendar-time method described above does not easily allow us to control for the effects of other variables on future stock returns. There might be differences in firm characteristics between high and low voluntary equity exposure firms, which might be related to expected returns. Table III reports results of various multivariate regression specifications with characteristic-adjusted abnormal

⁶ Including a liquidity factor (Pastor and Stambaugh (2003)) as a fifth factor does not affect our results.

returns as the dependent variable. All specifications include year-month fixed effects and standard errors are clustered by year-month. The first specification has *High Voluntary Abnormal Exposure Dummy* as the main dependent variable and only past stock return as control. The second specification had a number of other control variables: book-to-market ratio of the firm, logarithm, of market capitalization, logarithm of firm age plus one, logarithm of CEO age plus one, logarithm of CEO tenure plus one. We also include either the G-Index or the E-Index, which have been shown to be related to future returns in prior research (Gompers, Ishii, and Metrick (2003), and Bebchuk, Cohen, and Ferrell (2009)). We find that after controlling for firm characteristics, firms with high voluntary abnormal equity exposure of CEOs have abnormal returns of 0.52% per month, which is statistically significant at the 1% level. This translates into an abnormal return of 6.24% annually. Column (4) to (6) presents the results using a different definition of high voluntary exposure. Specifically we use the *High Voluntary \$ Exposure Dummy*. The result and magnitude of the coefficients are very similar to the results in columns (1) to (3). The economic magnitude of the annual abnormal returns across all specifications in this table ranges from 4.9% to 9%.

Table IV shows the results for regressions similar to those in Table III using the other definitions of the dummy variable that captures high voluntary equity exposure of the CEO. Specifically we use the dummy variables based on size adjusted exposure, scaling of equity exposure by Dittman and Maug (2007) wealth variable, scaled by total compensation in the previous year. The statistical significance and economic magnitudes are similar across all the voluntary equity exposure dummy specifications. These results suggest that the relation we document is not driven by the choice of the scaling variable for total equity exposure.

C. Controlling for Purchases

It is possible that the observed relation between the high level of voluntary equity exposure and future abnormal returns is due only to large purchases made by the CEO before good stock price performance. This would be consistent with the insider trading literature that suggests that CEOs' purchases and sales are a result of information. To distinguish our results from insider trading, we include CEO stock purchases as a control variable. We calculate the total dollar purchases of stocks during the fiscal year from the Thomson Financial Insider Database, which obtains the information for Form 4 filings made by the CEO to the SEC. To make the amount of purchase comparable across CEOs, we scale this by a proxy for the wealth of the CEO based on Gabaix and Landier (2008) – the product of firm size to the power $1/3$ and reference firm size to the power $2/3$. The results are shown in Table V, Panel A. Even after controlling for CEO net stock purchases, the high voluntary abnormal exposure dummy predicts a monthly abnormal return of at least 0.40% per month across all specifications. In columns (1)-(3) we report results where the dependent variable of interest is *High Voluntary Abnormal Exposure Dummy*. After controlling for firm characteristics, CEO characteristics, and scaled insider purchases, we find that a high voluntary abnormal exposure is associated with about 0.50% per month abnormal return which is statistically significant at the 1% level and economically large. Additionally the results for the *High Voluntary \$ Exposure Dummy* are also qualitatively similar. These results are reported in columns (4)–(6) of Table V, Panel A.

A recent paper by Cohen et. al. (2012) distinguishes between regular trades, which are predictable in their timing, and irregular (or opportunistic) insider trades. They find that irregular sales made by

insiders are the ones associated with future abnormal return performance, while regular sales are not. We further refine our above analysis based on this. We define irregular sales, regular sales, and irregular purchases by the CEO, and control for these variables in our regression specifications. A trade is defined as regular, if the CEO had made a trade in the same calendar month in each of the previous three calendar years.⁷ One difference our variable and Cohen et. al. (2012) is that they examine regular purchases and sales by all insiders, while we examine these trades only for the CEO. This is the appropriate variable to control for in our context, as our main dependent variable is based only on the equity exposure of the CEO.

The results are reported in Table V, Panel B. To make the variables comparable we scale the dollar value of purchases and sales by the product of firm size to the power 1/3 and reference firm size to the power 2/3. We find that controlling for these variables does not alter the economic significance of our main result. Specifically we find that high voluntary exposure of the CEO is associated with at least 50 basis points per month abnormal performance in the next year (Column (8), Table V, Panel B). This translates in a 6% annualized return.

These results suggest that abnormal returns effect that we find is not a result of purchases by the CEO. In this context, one should note that our return measurement window starts at least four months after the end of the fiscal year. Therefore, the period over which we examine abnormal returns is after the typical window over which the insider trading literature examines abnormal returns after purchases.

⁷ Note that none of the purchases by CEOs get classified as a regular insider purchases during our sample period.

D. Interaction with Information Advantage

If the relation between voluntary holdings and abnormal returns that we document is due to information of the CEO, we would expect to find that this relation is more pronounced in situations where the CEO has a greater information advantage. This is what we test next. A large insider trading literature finds that trades of executives in smaller firms are much more informative. This is because these firms are not followed as closely by market participants as larger firms, resulting in a greater information advantage to insiders. In each year, we classify our sample of firms into small firms, i.e., firms with size below median in terms of market capitalization, and large firms.

Similarly, we classify firms in other ways that capture a greater information advantage to the CEO. Firms that are young, that report negative profits, or that do not pay dividends are likely to be difficult to value, since it is relatively more difficult to forecast future cash flows. The CEO might have a greater information advantage in such cases. Further, firms that have a high volatility of stock prices or that are covered by very few analysts are likely to be associated with a higher asymmetry of information between insiders and outsiders. Lastly, a high dispersion of analyst forecasts suggests insufficient information about the firm's prospects in the market, which implies greater information advantage of the CEO over outsiders.

For each of the continuous variables in the above list, we classify firms into *high* and *low* categories in every sorting year. Volatility is measured by the standard deviation of monthly returns over the past three years. We construct a measure of analyst dispersion as the standard deviation of the forecast dispersion scaled by the average earnings forecast. The data source for analyst forecasts is I/B/E/S.

We run multivariate regressions that include an interaction term of the *High Voluntary Abnormal Exposure Dummy*, which captures high voluntary equity exposure, and another dummy variable that captures higher information advantage. All our usual controls for firm characteristics, CEO characteristics, and CEO purchases are included. Table VI shows the results. We find that the coefficient on the interaction term is positive for all cases and is statistically significant for all cases except low number of analysts. This implies that the relation between *High Abnormal Exposure Dummy* and future abnormal returns is stronger for firms with greater information advantage (i.e. smaller, younger, high volatility, firms with negative profits, non-dividend paying, and those having a high dispersion of analyst forecasts). The economic magnitudes implied are also large. Specifically, a firm that is below median in terms of market capitalization has 0.33% higher abnormal returns per month than a firm that not, when CEOs of both firms have a high voluntary equity exposure (as shown in Column (1) of Table VI). Similarly, when CEOs have high voluntary equity exposure, firms that are below that median in terms of age, earn abnormal returns of 55 basis points more per month of over the next year compared to firms that are older (shown in column (2) of Table VI). Taken together, these results lend support to our hypothesis that the relation between future stock returns and voluntary holdings is related to information that the CEO has about the future value of the firm.

E. Can An Omitted Risk Factor Explain Our Results?

If the firms where the CEOs have high voluntary exposure have an exposure to a risk factor that we do not control for, the abnormal returns that we find would just be compensation for that risk. We

now provide evidence that such an argument is unlikely to explain away our results. We consider several variations of the missing risk factor argument and discuss them one by one.

First, let us consider the possibility that some firms have a constant high exposure to a certain risk factor X , which we do not control for while calculating abnormal returns. Let us suppose that for some reason CEOs of these firms tend to choose to have a high voluntary exposure. For example, the CEOs of these firms could be over-optimistic, either because they become over-optimistic over time, or such CEOs are deliberately chosen. Then we would observe these over-optimistic CEOs taking on a high equity exposure to their firms' equity and also observe positive abnormal returns in the future from a model that does not correct for risk factor X .

The above argument implies that the firms that earn abnormal returns for one year should continue to earn positive abnormal returns in the future as compensation for their exposure to the risk factor. Table VII shows the abnormal returns for firms one year to five years after the CEO has been observed to have high voluntary equity exposure. We note that such firms earn significant positive abnormal returns for two years in the future, after which the abnormal returns die out. For the value-weighted portfolio, the abnormal returns are not statistically significant starting from the second year. Specifically we find that the return difference between the high and low exposure is about 73 basis points per month in the equally weighted portfolio and 42 basis points in the value weighted portfolio for 1 year ahead and then diminishes to 23 basis points in the equally weighted portfolio 2 years ahead and 16 basis points in the value weighted portfolio. These results suggest that our results are unlikely to be driven by some firms having a high exposure to an unobserved risk

factor. They also rule out the possibility that certain persistent characteristics associated with higher abnormal returns drive our main results. The analysis of how long abnormal returns persist is also helps us understand how long-lived the information that CEO possess can be.

It is possible that the exposure to the omitted risk factor or the unobserved characteristic is time varying. In such a case, the fact that abnormal returns persist for only two years is not sufficient evidence against a missing risk factor argument. While calculations of long-run abnormal returns suffer from a possibility that all risks are not properly accounted for and also suffer from many other measurement concerns Fama (1998). Abnormal returns calculated over short windows are relatively immune from such concerns. If the CEO has some information, either hard or soft, a portion of this is likely to be revealed to the market during future earnings announcements. Table VIII shows the cumulative abnormal returns around a three-day window around earnings announcements in the subsequent year for firms with CEOs having high voluntary holdings and other firms. Specifically, we consider all earnings announcements that are more than six months and less than eighteen months from the end of the fiscal year of voluntary holdings measurement. Following Edmans (2010), abnormal returns are calculated from a market model in which the coefficients are estimated over a 255-day period ending 46 days before the earnings announcement. High voluntary exposure firms have a higher abnormal return of 0.35% to 0.44% around earnings announcements, suggesting that the market is positively surprised for such firms. In the regression results as shown in Panel B we find that that after controlling for size, book-to-market, and a number of other firm and CEO characteristics, high voluntary exposure is associated with 31 basis points abnormal returns over the three day window around earnings announcements. All regressions include year-month fixed effects.

These results taken together suggest that exposure to a risk factor cannot fully explain the relation between high voluntary exposure of the CEO and future returns.

F. Voluntary and Forced Equity Exposure and Future Returns

We now try rule out the possibility that the relation we document is driven by the entire equity exposure of the CEO, irrespective of whether it is voluntary or not. We examine the relation between the extent of voluntary and forced holdings of the CEOs. Voluntary holding is defined as unrestricted shares, while forced holdings consists of all other kinds of equity exposure. We scale voluntary and forced holdings by the product of firm size to the power $1/3$ and reference firm size to the power $2/3$. We sort all firms in the same sorting year by scaled voluntary holdings and define a dummy variable *High Size Adjusted Voluntary Holdings Dummy* to be 1 for those in the top quartile. Similarly we define *High Size Adjusted Forced Holdings Dummy* based on the scaled forced holdings. Table IX reports regression results of characteristic-adjusted returns on these two dummy variables and various sets of control variables. In general, we find that as high voluntary holding is significantly related to abnormal return over the next year, while high forced holding is not. Columns (4) to (6) show that these results are robust to the inclusion of our usual controls for CEO and firm characteristics. In addition, these results are robust to the inclusion of insider purchases as a control variable. These results are shown in columns (7)-(9).

The above results help our understanding of our main results better. A possible explanation for our results could be that equity exposure induces the manager to exert more effort, which in turn leads to higher returns. If this were the case, we should see positive abnormal returns when CEOs have

high exposure, irrespective of whether the exposure is voluntary or not. However, if future abnormal returns are due to information, high equity exposure would forecast good stock performance only when the exposure is voluntary but not otherwise. Therefore, the results in Table IX support the information story but not the effort story.

G. Robustness: Controlling for Mandatory Stock Holding Requirements

Some firms might have specified “mandatory stock holding requirements” (Core and Larcker (2002)) i.e., they require the CEO to hold on to shares of the firm over and above the restricted stock holdings. In the analysis so far we have not taken into account. Not taking this into account introduces noise in our measure of whether the CEO holds any stock voluntarily over and above what she is forced to hold. However, to deal with this issue better, we collect information for CEOs on their mandatory holdings requirements from the proxy statements for the year 2006. Mandatory requirements can take on different forms. CEOs might be required to hold a multiple of their salary in their firm’s stock, or be required to hold a certain dollar amount or a specified number of shares. For each CEO in 2006 we first document whether a firm has a mandatory holding requirement policy by reading through the proxy statement for the fiscal year 2006. We then collect information on the nature of the mandatory holding requirement. For example if the CEO is required to hold a certain number of shares then we record the number of shares that the CEO is forced to hold. We assume that the observed holding requirements in 2006 imposed by the firm were in force throughout our sample period, i.e., from 1994 to 2006. We do this to keep data collection effort reasonable, and because firms began disclosing their mandatory holding requirement only in the later

years. Our strategy might overestimate the mandatory holding requirement for firms, especially for the earlier years of our sample.

Stocks held as a result of mandatory holding requirements cannot be considered as being voluntarily held by the CEO. Therefore, we redefine voluntary holdings dummy, which is based on the fraction of total equity exposure that is voluntary, by accounting for the mandatory holding requirements of CEOs. To do this we first calculate the dollar amount of mandatory holdings. If the requirements are in the form of the number of shares we multiply this by the end of year prices to get it in dollar terms. We subtract the mandatory holding requirement in dollars from the level of voluntary holdings of the CEO and we add it to the level of forced holdings. Our final voluntary holdings dummy is based on this new definition of forced and voluntary holdings of the CEO. As usual, we define high voluntary holdings based on the top quartile of the ratio of voluntary holdings to total holdings. Note that the total equity exposure does not change due to the above changes in definition. *High Abnormal Exposure Dummy* is then defined based on the new definition of voluntary holdings dummy and firms in the top quartile by total equity exposure. Similarly, all other dummy variables that capture high voluntary holdings by the CEO are redefined.

Some firms have a “stock retention requirement,” in addition to mandatory stock holding requirement. While mandatory holding requirements specify a target level of holdings, retention requirements usually restrict the CEO from selling a specific fraction of the shares that were obtained after exercising options, for a specified period of time after exercising. The exact nature of these retention requirements is often not described in sufficient detail in the proxy statement. We

therefore create a dummy variable to capture whether the firm has stock retention requirements. *Stock Retention Dummy* is 1 if the firm has such requirements and 0 if not.

We report results from regressing characteristic adjusted returns on the redefined dummy variables capturing high voluntary exposure of the CEO and various control variables, including *Stock Retention Dummy*, in Table X. Column (2) shows that firms with high voluntary exposure earn abnormal returns of 50 basis points per month in the next year, after accounting for mandatory holding requirements and controlling for stock retention requirement dummy and the usual set of control variables. This effect is both statistically significant at the 1 % level and economically large. This is comparable to our baseline results (in Table III) where firms earned an abnormal return of 51.8 basis points per month. Our results are similar for all other measures with other scaling choices for total equity exposure, as shown in columns (3)-(10) of Table X. Taken together these results suggest that even after accounting for mandatory holding requirements high voluntary exposure on the part of the CEO is significantly correlated with high abnormal returns one year ahead.

IV. Conclusion

Our paper examines whether the level of voluntary holdings is related to future abnormal equity returns of the firm. In doing so, we point out that the level of holdings could be a better indicator than stock purchases of positive information of the CEO. However, the level of equity exposure would be informative of the CEO's views only when it reveals her desired equity exposure level. We

argue that when the CEO is voluntarily holding *some* stock, her *entire* equity exposure, including the part that is forced due to equity based compensation, must represent her desired equity exposure level. After incorporating this insight while measuring exposure levels, we show that when the CEO voluntarily has a high level of equity exposure, the firm's stock has abnormal positive performance in the future. However, a high equity exposure that is forced due to equity-linked instruments as a part of CEOs' compensation does not forecast high returns.

The variables that forecast future abnormal returns work better in situations when the CEO is likely to have a greater information advantage over outsiders. In particular, the abnormal returns are higher for firms that are smaller, younger, have a high volatility of stock returns, do not have positive profits, and do not pay dividends, and those with a high dispersion of analyst forecasts. High voluntary holdings also forecast abnormal returns around earnings announcements in the subsequent year. Overall, our results suggest that CEOs have information about future stock price performance and use that information to choose their equity exposure levels to the firm, which is one possible explanation for the seemingly puzzling observation that many CEOs seem to hold large amounts of their own companies' stock voluntarily.

Our results also imply that the market does not completely incorporate information contained in executive stock holdings into prices. If markets are efficient, we would not expect to see any predictability of future returns based on equity exposure of the CEO after the information becomes publicly available. However, a large literature on insider trading consistently finds that trades by executives and directors, especially purchases, forecast future returns. Our study shows that

information about equity exposure *levels* of the CEO is also not incorporated into prices quickly and efficiently.

References

- Bebchuk, Lucian, Alma Cohen, and Allen Ferrell, 2009, What matters in corporate governance?, *Review of Financial Studies* 22, 783-827.
- Carhart, Mark M., 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57-82.
- Cohen, Lauren, Christopher Malloy, and Lukasz Pomorski, 2012, Decoding inside information, *Journal of Finance* 67, 1009-1043.
- Cooper, Michael J., Huseyin Gulen, and Raghavendra Rau, 2011, The cross-section of stock returns and incentive pay, Working paper, Purdue University.
- Core, John E., and Wayne Guay, 2002, Estimating the value of employee stock option portfolios and their sensitivities to price and volatility, *Journal of Accounting Research*, 40, 613-630
- Core, John E., and David F. Larcker, 2002, Performance consequences of mandatory increases in executive stock ownership, *Journal of Financial Economics* 64, 317-340.
- Daniel, Kent, Mark Grinblatt, Sheridan Titman, and Russ Wermers, 1997, Measuring mutual fund performance with characteristic-based benchmarks, *Journal of Finance* 52, 1035-1058.
- Demsetz, Harold, and Belén Villalonga, 2001, Ownership structure and corporate performance, *Journal of Corporate Finance* 7, 209-233.
- Dittmann, Ingolf, and Ernst Maug, 2007, Lower salaries and no options? On the optimal structure of executive pay, *Journal of Finance* 62, 303-343.
- Edmans, Alex, 2010, Does the stock market fully value intangibles? Employee satisfaction and equity prices, *Journal of Financial Economics* forthcoming.
- Edmans, Alex, Xavier Gabaix, and Augustin Landier, 2009, A multiplicative model of optimal CEO incentives in market equilibrium, *Review of Financial Studies* 22, 4881-4917.
- Fama, Eugene F, 1998, Market efficiency, long-term returns, and behavioral finance, *Journal of Financial Economics* 49, 283-306.
- Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56.

- Gabaix, Xavier, and Augustin Landier, 2008, Why has CEO pay increased so much?, *Quarterly Journal of Economics* 123, 49-100.
- Gompers, Paul, Joy Ishii, and Andrew Metrick, 2003, Corporate governance and equity prices. *Quarterly Journal of Economics* 118, 107-155
- Himmelberg, Charles P., R. Glenn Hubbard, and Darius Palia, 1999, Understanding the determinants of managerial ownership and the link between ownership and performance, *Journal of Financial Economics* 53, 353-384.
- Jaffe, John F., 1974, Special information and insider trading, *Journal of Business* 47,410–428.
- Jegadeesh, Narasimhan, 1990, Evidence of predictable behavior of security returns, *Journal of Finance* 45, 881-898
- Jeng, Leslie A., Andrew Metrick, and Richard Zeckhauser, 2003, Estimating the returns to insider trading: A performance-evaluation perspective, *Review of Economics and Statistics* 85, 453-471.
- Jenter, Dirk, Katharina Lewellen, and Jerold B. Warner, 2011, Security issue timing: What do managers know, and when do they know it?, *Journal of Finance* 66, 413-443.
- Lakonishok, J, and I. Lee, 2001, Are insider trades informative?, *Review of Financial Studies* 14, 79-111.
- Lyon, John D., Brad M. Barber, and Chih-Ling Tsai, 1999, Improved methods for tests of long-run abnormal stock returns, *Journal of Finance* 54, 165-201.
- McConnell, John J., and Henri Servaes, 1990, Additional evidence on equity ownership and corporate value, *Journal of Financial Economics* 27, 595-612.
- Mehran, Hamid, 1995, Executive compensation structure, ownership, and firm performance, *Journal of Financial Economics* 38, 163-184.
- Merton, Robert C., 1969, Lifetime portfolio selection under uncertainty: The continuous-time case, *Review of Economics and Statistics* 51, 247-257.
- Morck, Randall, Andrei Shleifer, and Robert W. Vishny, 1988, Management ownership and market valuation: An empirical analysis, *Journal of Financial Economics* 20, 293-315.
- Pastor, Lubos, and Robert F. Stambaugh, 2003, Liquidity risk and expected stock returns, *Journal of Political Economy* 111, 642-685.

Rozeff, Michael S., and Mir A. Zaman, 1998a, Market efficiency and insider trading: New evidence, *Journal of Business* 61, 25-44.

Rozeff, Michael S., and Mir A. Zaman, 1998b, Overreaction and insider trading: Evidence from growth and value portfolios, *Journal of Finance* 53, 701-16.

Scott, James, and Peter Xu, 2004, Some insider sales are positive signals, *Financial Analysts Journal*, 60, 44-51.

Seyhun, H. Nejat, 1986, Insiders' profits, costs of trading, and market efficiency, *Journal of Financial Economics*, 16, 189-212.

Seyhun, H. Nejat, 1992, Why does aggregate insider trading predict future stock returns?, *Quarterly Journal of Economics* 107, 1303-31.

Seyhun, H. Nejat, 1998, *Investment Intelligence from Insider Trading*, MIT Press, Cambridge.

Appendix A

Construction of benchmark portfolios

This appendix describes the construction of matching portfolios. The method is similar to the one used in Daniel et al. (1997). Stocks in the CRSP-Compustat matched universe are classified every month into 250 bins through dependent $10 \times 5 \times 5$ sorts based on size (market equity value), book-to-market ratio and momentum. Size and book-to-market sorts are performed once a year at the end of June, while the momentum sorts are performed monthly. Therefore, stocks can change bins every month. Every June, stocks in the CRSP-Compustat universe are first sorted into size deciles based on market equity, the product of number of shares and share price, obtained from CRSP. Then the stocks within each size decile are further sorted into quintiles based on their book-to-market ratio. In calculating the book-to-market ratio, we use the book equity from the previous year and the market equity on the last trading day of the previous year. Book equity is stockholder's equity plus any deferred taxes and any investment tax credit, minus the value of any preferred stock, all obtained from Compustat. To determine the value of preferred stock, we use redemption value if this is available; otherwise, we use liquidating value if it is available and, if not, we use carrying value. The end of June is used as the sorting date because the annual report containing the book-equity value for the preceding year is virtually certain to be public information by that time (Fama and French (1993)). The above procedure sorts stocks into 50 bins based on size and book-to-market ratio at the end of every June, which applies to all months from July of the sorting year to June of the subsequent year. Within each of these 50 bins, at the beginning of every month, firms are further sorted into quintiles based on the returns over the 12 months preceding the month before the

sorting month. The return over the month preceding the sorting month is not used. This avoids problems associated with bid-ask bounce and monthly reversals (Jegadeesh (1990)). Only those firms for which book equity data are available from Compustat and are positive, have prices available on CRSP in both December of the previous year and June of the sorting year, and have monthly returns data in CRSP for at least six out of the twelve months required for momentum sorting are classified into bins by the above procedure. The value-weighted returns of stock in each of the 250 bins are calculated on each day and used as the return on the matched portfolio for stocks in that bin. The above procedure ensures that the number of firms in the 250 matching portfolios is more or less equal at all times.

Appendix B

Definitions of variables used in tables

Variable	Definition	Source
Abnormal Equity Exposure	The residual from the regression of $\ln(\text{\$ equity exposure})$ on $\ln(\text{total firm value})$ and Fama and French (1993) 48 industry fixed effects and year fixed effects. $\text{\$ Equity Exposure}$ is defined below. Total firm value is calculated as market capitalization of the firm plus book value of debt. Abnormal Equity Exposure is winsorized at 2 nd and 98 th percentile for all empirical analysis.	Execucomp and Compustat
$\text{\$ Equity Exposure}$	Price per share at fiscal year end multiplied by the total delta of equity exposure of the CEO (i.e. the sum of number of unrestricted stock, number of restricted stock and total delta of all options) as of the end of the fiscal year. To calculate this, variable we follow the methodology described in Appendix B of Edmans, Gabaix and Landier (2009) for calculation of B^{III} . Finally, the variable is winsorized at the 2 nd and 98 th percentile for all empirical analysis.	Execucomp
Size-Adjusted Equity Exposure	$\{(\text{\$ Equity Exposure})/(\text{total firm value})^{(1/3)}/(\text{Reference firm value})^{(2/3)}\}$, where $\text{\$ Equity Exposure}$ is as defined above. Total firm value is calculated as market cap of the firm plus book value of debt, and reference firm value is defined as the total firm value for the median firm in S&P500 in that year. Finally, the variable is winsorized at the 2 nd and 98 th percentile for all empirical analysis.	Execucomp and Compustat
Wealth-Scaled Equity Exposure	$(\text{\$ Equity Exposure})/(\text{Estimated CEO Wealth})$, where Estimated CEO Wealth is the estimate of wealth obtained as in Dittman and Maug (2007) based on compensation data. Further details of the calculations are available at http://people.few.eur.nl/dittmann/documentation_of_welth_estimate.pdf . Finally, the variable is winsorized at the 2 nd and 98 th percentile for all empirical analysis.	Execucomp and http://people.few.eur.nl/dittmann/data.htm
Equity Exposure/ Total Compensation	$(\text{\$ Equity Exposure})/(\text{Total Compensation})$, where Total Compensation is tdc1 variable in Execucomp, which captures compensation from salary, bonus, value of stock option and other equity grants, and other compensation. Finally, the variable is winsorized at the 2 nd and 98 th percentile for all empirical analysis.	Execucomp
Stock Holding/ Total Holding	Ratio of value of unrestricted stock to the sum of values of unrestricted stock, restricted stock and vested and unvested options. The valuation of options is done using a methodology similar to that in Core and Guay (2002).	Execucomp
High Voluntary Proportion Dummy	A dummy variable that is 1 for all firms in the top quartile of (Stock Holding/Total Holding) ratio in that year, and 0 otherwise. Fiscal year end date of different firms may not be the same. For the above sorting, data for firms with fiscal year end date between March of calendar year t to	

	February of calendar year $t+1$ are considered as data for <i>year t</i> .	
High Voluntary Abnormal Exposure Dummy	Is a dummy variable that is 1 for firms satisfying a) it is in the top quartile of Abnormal Equity Exposure for that year, and b) High Voluntary Proportion Dummy is equal to 1. The definition of <i>year</i> of the data for sorting is as in High Voluntary Proportion Dummy.	
High Voluntary \$ Exposure Dummy	Is a dummy variable that is 1 for firms satisfying a) it is in the top quartile of \$ Equity Exposure for that fiscal year, and b) High Voluntary Proportion Dummy is equal to 1. The definition of <i>year</i> of the data for sorting is as in High Voluntary Proportion Dummy.	
High Voluntary Size-Adjusted Exposure Dummy	Is a dummy variable that is 1 for firms satisfying a) it is in the top quartile of Size-Adjusted Equity Exposure for that fiscal year, and b) High Voluntary Proportion Dummy is equal to 1. The definition of <i>year</i> of the data for sorting is as in High Voluntary Proportion Dummy.	
High Voluntary Wealth-Scaled Exposure Dummy	Is a dummy variable that is 1 for firms satisfying a) it is in the top quartile of Wealth-Scaled Equity Exposure for that fiscal year, and b) High Voluntary Proportion Dummy is equal to 1. The definition of <i>year</i> of the data for sorting is as in High Voluntary Proportion Dummy.	
High Voluntary Compensation-Adjusted Exposure Dummy	Is a dummy variable that is 1 for firms satisfying a) it is in the top quartile of (Equity Exposure/Total Compensation) for that fiscal year, and b) High Voluntary Proportion Dummy is equal to 1. The definition of <i>year</i> of the data for sorting is as in High Voluntary Proportion Dummy.	
Voluntary holdings	Value of unrestricted stock held by the CEO, calculated as the product of number of unrestricted shares and price per share at the end of the fiscal year.	Execucomp
Forced holdings	The sum of values of restricted stock and vested and unvested options. The valuation of options is done using a methodology similar to that in Core and Guay (2002).	Execucomp
Size-Adjusted Voluntary Holdings	$\{(\text{Voluntary holdings})/(\text{total firm value})^{1/3}/(\text{Reference firm value})^{2/3}\}$, where Voluntary holdings is as defined above. Total firm value is calculated as market cap of the firm plus book value of debt, and reference firm value is defined as the total firm value for the median firm in S&P500 in that year	Execucomp and Compustat
Size Adjusted Forced Holdings	$\{(\text{Forced holdings})/(\text{total firm value})^{1/3}/(\text{Reference firm value})^{2/3}\}$, where Forced holdings is as defined above. Total firm value is calculated as market cap of the firm plus book value of debt, and reference firm value is defined as the total firm value for the median firm in S&P500 in that year	Execucomp and Compustat
High Size-Adjusted Voluntary Holdings Dummy	A dummy variable that is 1 for all firms in the top quartile of Size-Adjusted Voluntary Holdings in that year, and 0 otherwise. For the above sorting, data for firms with fiscal year end date between March of calendar year t to February of calendar year $t+1$ are considered as data for <i>year t</i> .	

High Size-Adjusted Forced Holdings Dummy	A dummy variable that is 1 for all firms in the top quartile of Size-Adjusted Forced Holdings in that year, and 0 otherwise. For the above sorting, a <i>year</i> is defined as follows: fiscal year end date between March of calendar year <i>t</i> to February of calendar year <i>t+1</i> are considered as <i>year t</i> .	
Past stock returns	Buy-and-hold returns over the appropriate fiscal year.	CRSP
Book-to-market	Book equity scaled by the market equity on the last trading day. Book equity is stockholder's equity plus any deferred taxes and any investment tax credit, minus the value of any preferred stock, all obtained from Compustat. To determine the value of preferred stock, we use redemption value if this is available; otherwise, we use liquidating value if it is available and, if not, we use carrying value. Book-to-market is winsorized at the 1% and 99% level.	Compustat
Market cap	Market capitalization of the firm	Compustat
Firm age	The number of years the firm is in Compustat	Compustat
CEO age	Age of the CEO	Execucomp
CEO tenure	Number of completed years for which the CEO held the position at the same firm	Execucomp
G-index	Gompers, Ishii and Metrick (2003) firm-level governance score	http://faculty.som.yale.edu/andrewmetrick/data.html
E-index	Bebchuk, Cohen and Farrell (2009) firm-level entrenchment index	http://www.law.harvard.edu/faculty/bebchuk/data.html

Table I**Summary statistics**

Table I reports summary statistics for variables related to equity exposure of the CEO and firm characteristics for the sample of firms covered by the Execucomp database of Compustat from 1994 to 2006. Detailed definitions of all the variables can be found in Appendix B. All firm characteristics are measured at the end of fiscal year.

Panel A: Firm and CEO Equity Exposure Characteristics								
	N	Mean	Median	Std. Dev.	Minimum	25th Percentile	75th Percentile	Maximum
High Voluntary Abnormal Exposure Dummy	17980	0.133	0.000	0.339	0.000	0.000	0.000	1.000
High Voluntary \$ Exposure Dummy	18298	0.108	0.000	0.310	0.000	0.000	0.000	1.000
High Voluntary Size - Adjusted Exposure Dummy	17980	0.130	0.000	0.336	0.000	0.000	0.000	1.000
High Voluntary Wealth-Scaled Exposure Dummy	17396	0.096	0.000	0.295	0.000	0.000	0.000	1.000
High Voluntary Compensation Adjusted Exposure Dummy	18163	0.155	0.000	0.362	0.000	0.000	0.000	1.000
High Voluntary Proportion Dummy	18298	0.250	0.000	0.433	0.000	0.000	1.000	1.000
Abnormal Equity Exposure	17980	2.60	0.96	6.64	0.0002	0.44	2.24	198.51
\$ Equity Exposure	18348	79964.9	24285.3	156334.6	466.8	8295.9	72422.3	864764.7
Size-Adjusted Equity Exposure	18024	0.01	0.00	0.02	0.0001	0.00	0.01	0.11
Wealth Scaled Equity Exposure	17440	0.77	0.83	0.22	0.1470	0.66	0.93	1.00
Equity Exposure/ Total Compensation	18209	37.25	9.42	90.91	0.4928	4.32	22.80	529.47
Stock Holding / Total Holding	18298	0.51	0.50	0.33	0.0003	0.21	0.83	1.00
Voluntary Holdings	18351	111187.30	6089.47	1309920.00	0.00	1444.88	23724.23	7060000.00
Forced Holdings	18348	23522.08	5234.28	106110.30	0.00	1392.79	17197.42	5133525.00
Size-Adjusted Voluntary Holdings	18026	0.0114	0.0011	0.0726	0.00	0.0029	0.0042	3.1388
Size-Adjusted Forced Holdings	18024	0.0028	0.0010	0.0091	0.00	0.0034	0.0026	0.3933
Log (1+CEO age)	18992	4.027	4.043	0.136	3.367	3.951	4.111	4.522
Log (1+CEO tenure)	18757	1.895	1.946	0.791	0.000	1.386	2.485	4.025
Past Stock Returns	17487	0.1978	0.1209	0.5168	-0.7269	-0.0959	0.369	2.479
Book-to- market	17570	0.5396	0.4589	0.3704	0.0414	0.2778	0.7042	2.057
Log (Market Cap.)	17570	7.182	7.022	1.569	-1.839	6.081	13.139	13.139

Table II**The relation between abnormal returns and equity exposure of the CEO: Calendar-time portfolios**

The table presents abnormal returns (alphas) from a 4-factor Fama-French model for equally weighted and value-weighted portfolio of stocks for which the CEO has a high voluntary equity exposure and the rest. The sample is from January 1994 to December 2006. At the end of June in each year, firms are sorted into two portfolios: 'high voluntary exposure' and 'low voluntary exposure' based on various equity exposure related variables. The equity exposure variables are calculated based on information from the fiscal year that ends in February of that year, or earlier. Abnormal returns (alphas) are obtained by regressing portfolio returns on the 3 Fama-French factors and a momentum factor. Panel A presents results for characteristic-adjusted returns and Panel B presents results for raw returns. The assignment of firms into characteristic portfolios is described in detail in Appendix A. Characteristic-adjusted returns of a firm is the returns of the firm minus the returns on a portfolio of firms in the same characteristic portfolio. Detailed definitions of all compensation and equity-exposure-related variables can be found in Appendix B. Tests of difference for means are parametric t-tests. *, **, *** indicate statistical significance at the 10%, 5% and 1% level.

Panel A: Characteristic Adjusted Returns						
	High Exposure		Low Exposure		Difference	
	Abnormal Return (4 Factor)	T-test	Abnormal Return (4 Factor)	T-test	Abnormal Return (4 Factor)	T-test
<i>Equally Weighted Characteristic -Adjusted Returns</i>						
High Voluntary Abnormal Exposure Dummy	0.26%	2.167**	-0.47%	-8.247***	0.73%	6.293***
High Voluntary \$ Exposure Dummy	0.21%	1.705*	-0.44%	-7.667***	0.65%	4.990***
High Voluntary Size - Adjusted Exposure Dummy	0.23%	1.956**	-0.46%	-7.869***	0.69%	5.610***
High Voluntary Wealth-Scaled Exposure dummy	0.40%	3.142***	-0.45%	-8.023***	0.86%	6.547***
High Voluntary Compensation Adjusted Exposure Dummy	0.14%	1.103	-0.47%	-8.182***	0.61%	4.777***
<i>Value Weighted Characteristic -Adjusted Returns</i>						
	High Exposure		Low Exposure		Difference	
	Abnormal Return (4 Factor)	T-test	Abnormal Return (4 Factor)	T-test	Abnormal Return (4 Factor)	T-test
High Voluntary Abnormal Exposure Dummy	-0.05%	-0.384	-0.47%	-9.228***	0.42%	2.711***
High Voluntary \$ Exposure Dummy	0.01%	0.090	-0.47%	-9.289***	0.49%	3.183***
High Voluntary Size - Adjusted Exposure Dummy	-0.04%	-0.268	-0.47%	-9.208***	0.44%	2.799***
High Voluntary Wealth-Scaled Exposure dummy	0.06%	0.365	-0.46%	-9.147***	0.52%	2.946***
High Voluntary Compensation Adjusted Exposure Dummy	0.00%	-0.033	-0.47%	-9.357***	0.47%	3.130***

Panel B: Raw Returns

	High Exposure		Low Exposure		Difference	
	Abnormal		Abnormal		Abnormal	
	Return	T-test	Return	T-test	Return	T-test
<i>Equally Weighted Returns</i>	(4 Factor)		(4 Factor)		(4 Factor)	
High Voluntary Abnormal Exposure Dummy	0.77%	4.909***	0.03%	0.254	0.75%	6.180***
High Voluntary \$ Exposure Dummy	0.72%	4.477***	0.06%	0.599	0.66%	4.642***
High Voluntary Size - Adjusted Exposure Dummy	0.74%	4.839***	0.03%	0.336	0.71%	5.166***
High Voluntary Wealth-Scaled Exposure dummy	0.94%	6.188***	0.04%	0.417	0.90%	6.430***
High Voluntary Compensation Adjusted Exposure Dummy	0.62%	3.723***	0.03%	0.304	0.59%	4.034***

	High Exposure		Low Exposure		Difference	
	Abnormal		Abnormal		Abnormal	
	Return	T-test	Return	T-test	Return	T-test
<i>Value Weighted Returns</i>	(4 Factor)		(4 Factor)		(4 Factor)	
High Voluntary Abnormal Exposure Dummy	0.28%	1.568	-0.03%	-0.479	0.30%	1.546
High Voluntary \$ Exposure Dummy	0.39%	2.119**	-0.04%	-0.771	0.43%	2.093**
High Voluntary Size - Adjusted Exposure Dummy	0.29%	1.606	-0.03%	-0.627	0.33%	1.601
High Voluntary Wealth-Scaled Exposure dummy	0.30%	1.609	-0.01%	-0.099	0.30%	1.458
High Voluntary Compensation Adjusted Exposure Dummy	0.36%	1.995**	-0.04%	-0.697	0.40%	1.983**

Table III

The relation between abnormal returns and equity exposure of the CEO: OLS regressions

This table reports the coefficients from a linear regression of characteristic-adjusted monthly abnormal returns for firms from January 1994 to December 2006 on CEO equity ownership and firm characteristics measured at the end of the year. To match CEO and firm characteristics to returns we use the following definition of *year*. Fiscal years with end date between March of calendar year *t* to February of calendar year *t+1* are considered as year *t*. These data are then matched to returns from July of calendar year *t+1* to July of calendar year *t+2*. Characteristic-adjusted returns are created by subtracting returns on a portfolio of firms with similar characteristics from the returns of the firm. The assignment of firms into characteristic portfolios is described in detail in Appendix A. Detailed definitions for all compensation, equity-exposure-related and control variables can be found in Appendix B. All regressions include year-month fixed effects and standard errors clustered by year-month are reported in brackets below the coefficients. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Characteristic-Adjusted Returns (%)</i>						
High Voluntary Abnormal Exposure Dummy	0.7569*** [0.103]	0.5179*** [0.113]	0.5074*** [0.113]			
High Voluntary \$ Exposure Dummy				0.6160*** [0.103]	0.4216*** [0.117]	0.4082*** [0.118]
Past Stock Returns	-0.3113** [0.139]	-0.3357** [0.148]	-0.3360** [0.148]	-0.3130** [0.136]	-0.3403** [0.147]	-0.3406** [0.147]
Book-to-market		-0.0362 [0.143]	-0.0370 [0.143]		-0.0417 [0.143]	-0.0426 [0.143]
Log (Market Cap.)		0.0159 [0.031]	0.0135 [0.031]		0.0042 [0.032]	0.0016 [0.031]
Log(1+FirmAge)		-0.1442** [0.060]	-0.1481** [0.063]		-0.1408** [0.060]	-0.1456** [0.063]
Log(1+CEO Age)		-0.7576** [0.375]	-0.7556** [0.375]		-0.7089* [0.377]	-0.7069* [0.378]
Log(1+CEO Tenure)		-0.0061 [0.040]	-0.0066 [0.041]		0.0061 [0.039]	0.0055 [0.039]
G-Index		-0.0071 [0.015]			-0.0085 [0.015]	
E-Index			-0.0247 [0.028]			-0.0291 [0.028]
Constant	-0.1328*** [0.034]	2.3929 [1.508]	2.4076 [1.503]	-0.0626* [0.033]	3.6569** [1.517]	3.6727** [1.511]
Year-month Fixed Effects	+	+	+	+	+	+
Clustered Std. Errors by year-month	+	+	+	+	+	+
N	195,350	127,770	127,770	197,114	128,312	128,312
R ²	0.003	0.005	0.005	0.003	0.004	0.004

Table IV

Robustness of the relation between abnormal returns and equity exposure of the CEO to alternative definitions of equity exposure

This table reports linear regression results of characteristic-adjusted monthly abnormal returns for firms from January 1994 to December 2006 on CEO equity ownership and firm characteristics measured at the end of the year. To match CEO and firm characteristics to returns we use the following definition of *year*: Fiscal years with end date between March of calendar year *t* to February of calendar year *t+1* are considered as year *t*. These data are then matched to returns from July of calendar year *t+1* to July of calendar year *t+2*. Characteristic-adjusted returns are created by subtracting returns on a portfolio of firms with similar characteristic from the returns of the firm. The assignment of firms into characteristic portfolios is described in detail in Appendix A. Alternative definitions for the equity exposures are used. Detailed definitions for the compensation, equity-exposure-related and basic control variables can be found in Appendix B. All regressions include year-month fixed effects and standard errors clustered by year-month are reported in brackets below the coefficients. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Characteristic -Adjusted Returns (%)</i>						
High Voluntary Size - Adjusted Exposure Dummy	0.5090*** [0.116]	0.4979*** [0.117]				
High Voluntary Wealth-Scaled Exposure Dummy			0.4461*** [0.114]	0.4289*** [0.115]		
High Voluntary Compensation Adjusted Exposure Dummy					0.4341*** [0.105]	0.4220*** [0.105]
Past Stock Returns	-0.3366** [0.148]	-0.3368** [0.148]	-0.3049** [0.149]	-0.3059** [0.149]	-0.3338** [0.148]	-0.3344** [0.148]
Book-to-market	-0.0319 [0.143]	-0.0327 [0.143]	-0.0659 [0.146]	-0.0670 [0.146]	-0.0516 [0.141]	-0.0525 [0.141]
Log (Market Cap.)	0.0103 [0.032]	0.0081 [0.031]	0.0142 [0.031]	0.0106 [0.031]	0.0157 [0.032]	0.0132 [0.031]
Log(1+FirmAge)	-0.1408** [0.060]	-0.1446** [0.063]	-0.1645** [0.065]	-0.1657** [0.067]	-0.1379** [0.061]	-0.1418** [0.064]
Log(1+CEO Age)	-0.7577** [0.375]	-0.7555** [0.376]	-0.6815* [0.378]	-0.6808* [0.379]	-0.7657** [0.375]	-0.7621** [0.375]
Log(1+CEO Tenure)	-0.0077 [0.040]	-0.0081 [0.041]	0.0202 [0.039]	0.0182 [0.039]	0.0039 [0.039]	0.0033 [0.040]
G-Index	-0.0068 [0.015]		-0.0069 [0.015]		-0.0070 [0.015]	
E-Index		-0.0239 [0.028]		-0.0364 [0.028]		-0.0263 [0.028]
Year-month Fixed Effects	+	+	+	+	+	+
Clustered Std. Errors by year-month	+	+	+	+	+	+
N	127,770	127,770	122,100	122,100	127,568	127,568

Table V

Robustness of the relation between abnormal returns and equity exposure of the CEO to inclusion of purchases and sales by the CEO

This table reports the coefficients from a linear regression of characteristic-adjusted monthly abnormal returns for firms from January 1994 to December 2006 on CEO equity exposure and measures of purchases and sales of stock by the CEO. To match CEO and firm characteristics to returns we use the following definition of *year*: Fiscal year end date between March of calendar year t to February of calendar year $t+1$ are considered as year t . These data are then matched to returns from July of calendar year $t+1$ to July of calendar year $t+2$. Characteristic-adjusted returns are created by subtracting returns on a portfolio of firms with similar characteristic from the returns of the firm. The assignment of firms into characteristic portfolios is described in detail in Appendix A. *Insider Purchases Scaled by Wealth* is the CEO purchases scaled by wealth. CEO purchases are measured as the total dollar value of stocks purchased by the CEO during the previous fiscal year as reported in Thomson Financial Insider Database. The insider purchases are scaled by $(\text{size of firm})^{1/3} * (\text{reference firm size})^{2/3}$ to make it comparable across CEOs. Size of the firm is calculated as market capitalization of the firm plus book value of debt, and reference firm size is defined as the size of the median firm in S&P500 in that year. Multivariate regression results controlling for scaled insider purchases and other controls are reported in Panel A. In Panel B we report regression results when we control for regular and irregular insider trades (Cohen et. al. (2012)). A trade is defined as *regular*, if that insider had a trade in the same calendar month in each of the previous three calendar years. All other trades are defined as *irregular*. *Irregular Purchases scaled by Wealth* is CEO irregular insider purchases scaled by wealth. *Insider Regular (Irregular) Sales Scaled by Wealth* is defined as regular (irregular) insider CEO sales scaled by wealth. Detailed definitions for all compensation, equity-exposure-related and basic control variables can be found in Appendix B. All regressions include year-month fixed effects and standard errors clustered by year-month are reported in brackets below the coefficients. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

Panel A: Controlling for insider purchases						
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Characteristic - Adjusted Returns (%)</i>						
High Voluntary Abnormal Exposure Dummy	0.7544*** [0.104]	0.5034*** [0.113]	0.4928*** [0.113]			
High Voluntary \$ Exposure Dummy				0.6070*** [0.102]	0.4129*** [0.118]	0.3995*** [0.118]
Insider Purchases Scaled by Wealth	0.2894 [0.868]	1.4424 [1.156]	1.4428 [1.157]	0.3632 [0.865]	1.4633 [1.165]	1.4653 [1.165]
Past Stock Returns	-0.3147** [0.140]	-0.3344** [0.149]	-0.3347** [0.149]	-0.3044** [0.140]	-0.3329** [0.149]	-0.3332** [0.149]
Book-to- market		-0.0404 [0.143]	-0.0412 [0.143]		-0.0427 [0.143]	-0.0437 [0.143]
Log (Market Cap.)		0.0165 [0.032]	0.0142 [0.031]		0.0063 [0.032]	0.0039 [0.032]
Log(1+FirmAge)		-0.1427** [0.060]	-0.1460** [0.063]		-0.1416** [0.060]	-0.1458** [0.063]
Log(1+CEO Age)		-0.7498** [0.377]	-0.7476** [0.378]		-0.7129* [0.378]	-0.7109* [0.378]
Log(1+CEO Tenure)		-0.0004 [0.040]	-0.0009 [0.041]		0.0105 [0.040]	0.0099 [0.040]
G-Index		-0.0063 [0.015]			-0.0077 [0.015]	
E-Index			-0.0238 [0.028]			-0.0281 [0.028]
Year-month Fixed Effects	+	+	+	+	+	+
Clustered Std. Errors by year-month	+	+	+	+	+	+
N	195,074	127,641	127,641	195,074	127,641	127,641

Panel B: Controlling for regular and irregular insider purchases and sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(8)
<i>Characteristic -Adjusted Returns (%)</i>							
High Voluntary Abnormal Exposure Dummy	0.7542***	0.5029***	0.7543***	0.5047***	0.7556***	0.5116***	0.4955***
	[0.104]	[0.113]	[0.109]	[0.117]	[0.103]	[0.112]	[0.117]
Insider Irregular Purchases Scaled by Wealth	0.3271	1.5210					1.5441
	[0.866]	[1.147]					[1.152]
Insider Irregular Sales Scaled by Wealth			0.0031	0.0196			0.0218
			[0.040]	[0.039]			[0.039]
Insider Regular Sales Scaled by Wealth					0.3524	-0.1393	-0.3624
					[4.611]	[4.856]	[4.757]
Past Stock Returns	-0.3146**	-0.3343**	-0.3161**	-0.3425**	-0.3154**	-0.3374**	-0.3397**
	[0.140]	[0.149]	[0.139]	[0.148]	[0.140]	[0.149]	[0.149]
Book-to- market		-0.0409		-0.0298		-0.0364	-0.0342
		[0.143]		[0.147]		[0.144]	[0.146]
Log (Market Cap.)		0.0166		0.0137		0.0150	0.0152
		[0.032]		[0.031]		[0.031]	[0.031]
Log(1+FirmAge)		-0.1425**		-0.1433**		-0.1458**	-0.1400**
		[0.060]		[0.060]		[0.060]	[0.060]
Log(1+CEO Age)		-0.7502**		-0.7367**		-0.7407*	-0.7461**
		[0.377]		[0.372]		[0.375]	[0.374]
Log(1+CEO Tenure)		-0.0002		-0.0049		-0.0027	-0.0026
		[0.040]		[0.039]		[0.040]	[0.039]
G-Index		-0.0063		-0.0063		-0.0064	-0.0061
		[0.015]		[0.015]		[0.015]	[0.015]
Year-month Fixed Effects	+	+	+	+	+	+	+
Clustered Std. Errors by year-month	+	+	+	+	+	+	+
N	195,074	127,641	195,074	127,641	195,074	127,641	127,641

Table VI

The relation between abnormal returns and equity exposure of the CEO in firms where the CEO has a greater information advantage

This table reports linear regression results of characteristic-adjusted monthly abnormal returns for firms from January 1994 to December 2006 on *High Voluntary Abnormal Exposure Dummy*, variables capturing the extent of information advantage of the CEO, and interaction between these two variables. To match CEO and firm characteristics to returns data we use the following definition of *year*: Fiscal years with end dates between March of calendar year t to February of calendar year $t+1$ are considered as year t . These data are then matched to returns from July of calendar year $t+1$ to July of calendar year $t+2$. Characteristic-adjusted returns are created by subtracting returns on a portfolio of firms with similar characteristic from the returns of the firm. The assignment of firms into characteristic portfolios is described in detail in Appendix A. *Small* is a dummy variable that takes a value 1 if the market capitalization of the firm is less than the median for that year. Similarly, *Young* is a dummy variable that takes a value 1 if the age of a firm is less than the sample median. Firm age is the number of years since the firm first appeared in CRSP, measured to the nearest month. *High volatility* is a dummy variable that takes a value 1 if a firm's volatility is higher than the sample median. Volatility is defined as the standard deviation of monthly returns over the previous three years. *Not Profitable* is a dummy variable that takes a value 1 if the profits (EBITDA) of the firm is negative in the previous year. *Non dividend paying* is a dummy variable that takes a value 1 if a firm did not pay dividends in the previous year. *Low number of analysts* is a dummy variable that takes a value 1 if a firm has less than the sample median number of analysts. Number of analysts measures the number of analysts following the stock in the previous fiscal year. *High forecast dispersion* is a dummy variable that takes a value 1 if the dispersion of earnings forecast by analysts for that firm is higher than the sample median. The forecast dispersion measure is the EPS dispersion scaled by average EPS. Analyst information is obtained from I/B/E/S. Detailed definitions of compensation, equity exposure related, and basic controls can be found in Appendix B. *Insider Purchases Scaled by Wealth* are CEO purchases scaled by wealth. CEO purchases are measured as the total dollar value of stocks purchased by the CEO during the previous fiscal year as reported in Thomson Financial Insider Database. The insider purchases are scaled by $(\text{size of firm})^{1/3} * (\text{reference firm size})^{2/3}$ to make it comparable across CEOs. Size of the firm is calculated as market cap of the firm plus book value of debt, and reference firm size is defined as the firm size for the median firm in S&P500 in that year. All regressions include year-month fixed effects and standard errors clustered by year-month are reported in brackets below the coefficients. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

<i>Characteristic -Adjusted Returns (%)</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)
High Voluntary Abnormal Exposure Dummy	0.2996** [0.126]	0.2462** [0.115]	0.3172*** [0.100]	0.3214*** [0.114]	0.3157*** [0.098]	0.4674*** [0.131]	0.1937 [0.146]
Small	-1.6370*** [0.154]						
High Voluntary Abnormal Exposure Dummy*Small	0.3306* [0.189]						
Young		0.0012 [0.121]					
High Voluntary Abnormal Exposure Dummy*Young		0.5534*** [0.199]					
High Volatility			0.3516 [0.240]				
High Voluntary Abnormal Exposure Dummy*High Vol.			0.3624* [0.211]				
Non Profitable				0.2703 [0.318]			
High Voluntary Abnormal Exposure Dummy*Non Prof.				1.7853** [0.698]			
Non Dividend Paying					0.3658* [0.188]		
High Voluntary Abnormal Exposure Dummy*Non Dividend Paying					0.4502** [0.207]		
Low number of analysts						-0.1248 [0.108]	
High Voluntary Abnormal Exposure Dummy*Low No. of analysts						0.0172 [0.191]	
High Forecast Dispersion							0.5792*** [0.125]
High Voluntary Abnormal Exposure Dummy*High Forecast Disp.							0.4075* [0.209]
Insider Purchases scaled by wealth	1.6627 [1.149]	1.3954 [1.156]	1.2223 [1.146]	1.0371 [1.214]	0.3658* [0.188]	1.3252 [1.197]	1.3488 [1.305]
Past Stock Returns	-0.5790*** [0.154]	-0.3392** [0.150]	-0.3558** [0.149]	-0.3453** [0.157]	-0.3537** [0.149]	-0.3659** [0.150]	-0.3642** [0.157]
Book-to- market	-0.1344 [0.146]	-0.0404 [0.143]	-0.0201 [0.149]	-0.0799 [0.140]	-0.0166 [0.147]	-0.0328 [0.141]	-0.3194** [0.155]
Log (Market Cap.)	-0.3592*** [0.049]	0.0137 [0.032]	0.0493 [0.046]	0.0281 [0.036]	0.0380 [0.039]	-0.0101 [0.038]	0.0230 [0.031]
Log(1+Firm Age)	-0.7231* [0.374]	-0.1092 [0.085]	-0.0907* [0.053]	-0.1202** [0.058]	-0.0644 [0.054]	-0.1432** [0.059]	-0.1289** [0.060]
Log(1+CEO Age)	-0.0009 [0.041]	-0.6933* [0.373]	-0.6143* [0.341]	-0.6236* [0.370]	-0.5647* [0.341]	-0.7202* [0.376]	-0.7328* [0.400]
Log(1+CEO Tenure)	-0.0283* [0.016]	-0.0036 [0.040]	-0.0056 [0.039]	0.0370 [0.045]	-0.0119 [0.039]	-0.0083 [0.040]	-0.0022 [0.043]
G-Index	-0.1158* [0.059]	-0.0060 [0.015]	0.0016 [0.014]	-0.0054 [0.015]	0.0035 [0.013]	-0.0092 [0.016]	-0.0149 [0.016]
Year-month Fixed Effects	+	+	+	+	+	+	+
Clustered Std. Errors by year-month	+	+	+	+	+	+	+
N	127,450	127,641	127,210	111,096	127,641	124,682	113,522

Table VII
Relation between abnormal returns and CEO equity exposure: Long-run returns

The table presents difference in abnormal returns, (alphas) from a 4-factor Fama-French model, between a portfolio of firms with high voluntary equity exposure of the CEO and the remaining sample firms. Results for both equally weighted and value-weighted portfolios are presented. The sample is from January 1994 to December 2006. At the end of June in each year, firms are sorted into two portfolios: ‘high voluntary exposure’ and ‘low voluntary exposure’ based on *High Voluntary Abnormal Exposure Dummy*. This dummy variable is calculated based on information from the fiscal year that ends in February of that year, or earlier. “1 year ahead” abnormal returns (alphas) are obtained by regressing characteristic-adjusted returns on the 3 Fama-French factors and a momentum factor for July of that year to June of the next year. This is exactly the same as our baseline specification presented in Table II. “2 year ahead” abnormal returns are obtained similarly by calculating abnormal returns (alphas) over the 12 months subsequent to the “1 year ahead” period. Similarly, 3 year ahead, 4 year ahead, and 5 year ahead represent abnormal returns over the appropriate 12 months periods. Detailed definition of *High Voluntary Abnormal Exposure Dummy* can be found in Appendix B. Tests of difference for means are parametric t-tests. *, **, *** indicate statistical significance at the 10%, 5% and 1% level.

	High Exposure-Low Exposure			
	Abnormal Return (4 Factor)	T-test	Abnormal Return (4 Factor)	T-test
	Equally-Weighted		Value-Weighted	
1 year ahead	0.73%	6.293***	0.42%	2.711***
2 year ahead	0.23%	3.632***	0.16%	0.818
3 year ahead	0.11%	1.124	0.27%	1.533
4 year ahead	0.15%	1.529	0.14%	0.870
5 year ahead	0.16%	1.559	0.02%	0.155

Table VIII

Relation between abnormal returns around earnings announcements and CEO equity exposure

The table presents abnormal returns over a [-1, 1] day window around quarterly earnings announcements for firms where the CEOs have a high voluntary abnormal exposure compared to the remaining firms. CEO equity exposure is matched to all earnings announcements between 6 and 18 months from the fiscal year end date for which we obtain the compensation and equity exposure information of the CEO. At the end of each year firms are sorted into two portfolios based on 'high voluntary exposure' and 'low voluntary exposure' based on various dummy variables capturing high voluntary equity exposure. Abnormal returns are calculated from a market model in which the coefficients are estimated over a 255-day period ending 46 days before the earnings announcement. Panel A compares the average announcement returns of firms with high voluntary abnormal exposure as compared to remaining firms. Panel B regress announcement returns on the dummy variable for firms where the CEO has high equity exposure and other control variables. Detailed definitions for various dummy variables capturing high voluntary equity exposure can be found in Appendix B. *Insider Purchases Scaled by Wealth* are CEO purchases scaled by wealth. CEO purchases are measured as the total dollar value of stocks purchased by the CEO during the previous fiscal year as reported in Thomson Financial Insider Database. The insider purchases are scaled by a proxy for wealth to make it comparable to across CEOs. Our proxy for wealth is $(\text{size of firm})^{1/3} * (\text{reference firm size})^{2/3}$. Size of the firm is calculated as market cap of the firm plus book value of debt, and reference firm size is defined as size of the median firm in S&P500 in that year. All regressions include year-month fixed effects and standard errors clustered by year-month are reported in brackets below the coefficients. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

Panel A: Univariate Results						
	High Exposure		Low Exposure		Difference	
	Abnormal Return (-1,+1)	Stdev	Abnormal Return (-1,+1)	Stdev	Abnormal Return (-1,+1)	T-test
High Voluntary Abnormal Exposure Dummy	0.68%	0.0732	0.24%	0.0745	0.44%	5.42
High Voluntary \$Exposure Dummy	0.66%	0.0704	0.26%	0.0752	0.40%	4.52
High Voluntary Size - Adjusted Exposure Dummy	0.68%	0.0719	0.24%	0.0747	0.44%	5.37
High Voluntary Wealth-Scaled Exposure dummy	0.62%	0.0717	0.27%	0.0749	0.35%	3.68
High Voluntary Compensation Adjusted Exposure Dummy	0.62%	0.0744	0.25%	0.0746	0.37%	4.86

Panel B: Multivariate Results		
	(1)	(2)
<i>Abnormal Return (-1, +1)*100</i>		
High Voluntary Abnormal Exposure Dummy	0.4393*** [0.084]	0.3075*** [0.116]
Insider Purchases scaled by wealth		0.2357 [1.096]
Book-to- market		-0.1741 [0.135]
Log (Market Cap.)		-0.0241 [0.031]
Log(1+Firm Age)		-0.1411*** [0.054]
Log(1+CEO Age)		-0.3573 [0.310]
Log(1+CEO Tenure)		0.0393 [0.046]
G-Index		0.0203 [0.014]
Year-month Fixed Effects	+	+
Clustered Std. Errors by year-month	+	+
N	72,027	42,594

Table IX

The relation between abnormal returns and forced and voluntary level of equity exposure of the CEO

This table reports linear regression results of characteristic-adjusted monthly abnormal returns for firms from January 1994 to December 2006 on the forced and voluntary equity ownership of CEOs and firm characteristics measured at the end of the year. To match CEO and firm characteristics to returns we use the following definition of *year*: Fiscal year end date between March of calendar year t to February of calendar year $t+1$ are considered as year t . These data are then matched to returns from July of calendar year $t+1$ to July of calendar year $t+2$. Characteristic-adjusted returns are created by subtracting returns on a portfolio of firms with similar characteristics from the returns of the firm. The assignment of firms into characteristic portfolios is described in detail in Appendix A. Detailed definitions for the compensation, equity-exposure-related and basic control variables can be found in Appendix B. *Insider Purchases Scaled by Wealth* are CEO insider purchases scaled by wealth. CEO purchases are measured as the total dollar value of stocks purchased by the CEO during the previous fiscal year as reported in Thomson Financial Insider Database. The insider purchases are scaled by a proxy for wealth to make it comparable to across CEOs. Our proxy for wealth is $(\text{size of firm})^{1/3} * (\text{reference firm size})^{2/3}$. Size of the firm is calculated as market cap of the firm plus book value of debt, and reference firm size is defined as size of the median firm in S&P500 in that year. All regressions include year-month fixed effects and standard errors clustered by year-month are reported in brackets below the coefficients. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Characteristic -Adjusted Returns (%)</i>									
High Size-Adjusted Voluntary Holdings Dummy	0.6579*** [0.080]		0.6521*** [0.082]	0.4773*** [0.084]		0.4703*** [0.086]	0.4705*** [0.085]		0.4631*** [0.087]
High Size-Adjusted Forced Holdings Dummy		0.1279 [0.093]	0.0718 [0.095]		0.1429 [0.092]	0.1141 [0.093]		0.1455 [0.092]	0.1166 [0.094]
Insider Purchases Scaled by Wealth							1.3743 [1.163]	1.7451 [1.153]	1.4071 [1.169]
Past Stock Returns	-0.3436** [0.142]	-0.3140** [0.140]	-0.3553** [0.141]	-0.3541** [0.150]	-0.3521** [0.148]	-0.3751** [0.149]	-0.3510** [0.151]	-0.3491** [0.148]	-0.3723** [0.149]
Book-to- market				-0.0220 [0.143]	-0.0331 [0.146]	-0.0028 [0.145]	-0.0262 [0.142]	-0.0373 [0.146]	-0.0067 [0.145]
Log (Market Cap.)				0.0042 [0.032]	-0.0007 [0.032]	-0.0045 [0.032]	0.0058 [0.032]	0.0010 [0.032]	-0.0031 [0.032]
Log(1+Firm Age)				-0.1274** [0.060]	-0.1462** [0.059]	-0.1189** [0.058]	-0.1247** [0.060]	-0.1421** [0.058]	-0.1161** [0.058]
Log(1+CEO Age)				-0.7653** [0.373]	-0.6182* [0.370]	-0.7471** [0.366]	-0.7737** [0.375]	-0.6308* [0.372]	-0.7553** [0.368]
Log(1+CEO Tenure)				-0.0319 [0.042]	0.0321 [0.038]	-0.0366 [0.042]	-0.0294 [0.043]	0.0339 [0.039]	-0.0341 [0.042]
G-Index				-0.0052 [0.015]	-0.0123 [0.015]	-0.0054 [0.015]	-0.0051 [0.015]	-0.0120 [0.015]	-0.0053 [0.015]
Year-month Fixed Effects	+	+	+	+	+	+	+	+	+
Clustered Std. Errors by year-month	+	+	+	+	+	+	+	+	+
N	195,547	195,523	195,523	127,784	127,772	127,772	127,784	127,772	127,772

Table X

Robustness of the relation between abnormal returns and equity exposure after controlling for mandatory holding requirements

This table reports linear regression results of characteristic-adjusted monthly abnormal returns for firms from January 1994 to December 2006 on CEO equity exposure and firm after controlling for mandatory CEO holding requirements. To match CEO and firm characteristics to returns we use the following definition of *year*: Fiscal year end date between March of calendar year t to February of calendar year $t+1$ are considered as year t . These data are then matched to returns from July of calendar year $t+1$ to July of calendar year $t+2$. Characteristic-adjusted returns are created by subtracting returns of a portfolio of firms with similar characteristic returns from the returns of the firm. The assignment of firms into characteristic portfolios is described in detail in Appendix A. Detailed definitions for the compensation, equity-exposure-related and basic control variables can be found in Appendix B. We collect information for CEOs on their mandatory holding requirements from the proxy statements for fiscal year 2006. We assume that the holding requirements in 2006 for a CEO are the same throughout the sample from 1994-2006. The mandatory holdings are denominated in dollars. If the requirements are given in the form of the number of shares we multiply this by the end of year prices to get dollar holdings. Voluntary holdings for this table are calculated as the voluntary holdings as defined in Appendix B less the mandatory holding requirements. Our final voluntary holdings dummy is based on the new definition of the level of forced and voluntary holdings of the CEO. We define high voluntary holdings based on the top 25th percentile value of the voluntary holdings as a proportion of total holdings. The stock retention variable is a dummy variable that takes a value 1 if there is a stock retention requirement imposed by the firm and 0 otherwise. *Insider Purchases Scaled by Wealth* are CEO insider purchases scaled by wealth. CEO purchases are measured as the total dollar value of stocks purchased by the CEO during the previous fiscal year as reported in Thomson Financial Insider Database. The insider purchases are scaled by a proxy for wealth to make it comparable to across CEOs. Our proxy for wealth is $(\text{size of firm})^{1/3} * (\text{reference firm size})^{2/3}$. Size of the firm is calculated as market cap of the firm plus book value of debt, and reference firm size is defined as the size of the median firm in S&P500 in that year. All regressions include year-month fixed effects and standard errors clustered by year-month are reported in brackets below the coefficients. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

<i>Characteristic -Adjusted Returns (%)</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High Abnormal Exposure Dummy(Acc for Mandatory Req.)	0.7331***	0.5014***								
	[0.101]	[0.113]								
High \$ Exposure Dummy (Acc for Mandatory Req.)			0.6037***	0.4170***						
			[0.103]	[0.118]						
High Voluntary Size - Adjusted Exposure Dummy(Acc for Mandatory Req.)					0.6855***	0.4929***				
					[0.095]	[0.118]				
High Voluntary Wealth-Scaled Exposure dummy (Acc for Mandatory Req.)							0.8011***	0.4227***		
							[0.121]	[0.119]		
High Voluntary Compensation Adjusted Exposure Dummy (Acc for Mandatory Req.)									0.6419***	0.4210***
									[0.101]	[0.107]
Stock Retention Dummy	0.2000	0.2209	0.1926	0.2240	0.1966	0.2243	0.2728	0.2730	0.2185	0.2296
	[0.182]	[0.186]	[0.182]	[0.185]	[0.183]	[0.186]	[0.182]	[0.182]	[0.182]	[0.186]
Past Stock Returns	-0.3122**	-0.3225**	-0.3119**	-0.3278**	-0.3085**	-0.3236**	-0.3027**	-0.2976**	-0.3127**	-0.3209**
	[0.132]	[0.147]	[0.130]	[0.147]	[0.133]	[0.148]	[0.134]	[0.148]	[0.131]	[0.148]
Book-to- market		-0.0342		-0.0398		-0.0305		-0.0627		-0.0530
		[0.146]		[0.146]		[0.146]		[0.148]		[0.144]
Log(Market Cap.)		0.0120		0.0002		0.0064		0.0104		0.0111
		[0.032]		[0.032]		[0.032]		[0.032]		[0.032]
Log(1+Firm Age)		-0.1424**		-0.1389**		-0.1392**		-0.1642**		-0.1372**
		[0.060]		[0.060]		[0.060]		[0.065]		[0.061]
Log(1+CEO Age)		-0.7063*		-0.6534*		-0.7058*		-0.6248		-0.7203*
		[0.380]		[0.382]		[0.380]		[0.382]		[0.379]
Log(1+CEO Tenure)		-0.0007		0.0105		-0.0024		0.0229		0.0101
		[0.041]		[0.040]		[0.041]		[0.040]		[0.040]
G-Index		-0.0041		-0.0054		-0.0038		-0.0042		-0.0042
		[0.015]		[0.015]		[0.015]		[0.015]		[0.015]
Year-month Fixed Effects	+	+	+	+	+	+	+	+	+	+
Clustered Std. Errors by year-month	+	+	+	+	+	+	+	+	+	+
Observations	191,729	126,206	193,435	126,726	191,741	126,207	184,052	120,580	192,082	125,995