Do CEOs Who Trade Shares Adopt More Aggressive Corporate Investment Strategies?

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Abstract: This paper investigates whether trading behavior of CEOs impacts the levels of corporate investment. Prior studies show that individuals who trade on the stock market are less financially conservative. We find that this behavioural attribute is consistent over both the individual and corporate domain. Corporations with trading CEOs have higher capital expenditure and make significantly more acquisitions, and CEOs with higher portfolio turnover engage in riskier forms of corporate investment. We contribute to the literature by enhancing the current understanding of what key attributes and traits motivate CEOs to engage in corporate investment.

Keywords: Corporate investment, CEO risk aversion, CEO compensation

EFM classification: 120

1. Introduction

Corporate investment is an integral part of business strategy. Investments such as research and development, capital expenditure and business acquisitions enable sustained economic growth by expanding and preserving competitive advantage. Previous studies relate the level of investment expenditure to the level of risk aversion of the top management, and have identified factors which impact the risk level of investment choices by managers and consequently by the firm. This may lead corporations with managers that are risk averse in their personal domain to invest less than the optimal level.

These factors can be identified in both the corporate and the personal domains of managers. At the corporate level, for example, adverse selection due to availability of cash flow has been shown to determine the level of investment expenditure (Myers and Majluf, 1984; Fazzari, Hubbard and Petersen, 1987). CEOs are reluctant to invest in positive NPV projects for which they do not have adequate information.[1] At the personal level, personal attributes and traits of managers are investigated to find out whether they are related to corporate decisions (Malmendier and Tate, 2005; Cronqvist, Makhaija and Yonker, 2012). For example, Malmendier, Tate and Yan (2010) suggest that certain behavioral traits and characteristics are unconditionally related to effective corporate innovation. Cronqvist, Makhaija and Yonker (2012) test the hypothesis that individuals

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[1] Agency conflicts is another example, when the different incentives of shareholders and managers lead top management to be cautious about engaging in additional risky but value-enhancing investments, as these may weaken the position of management (Jensen, 1986). However, performance related compensation schemes are used to bridge the agency conflict between managers and shareholders, creating incentives for risk averse managers to invest more (Jensen and Meckling, 1976; Haugen and Senbet, 1981; Guay, 1999; Manso, 2011; Burkart and Raff, 2014; Bolton, Mehran and Shapiro 2015).

behave similarly in various contexts and find that there is a link between CEOs private home leverage and the debt ratio of the corporates they manage.[2]

In this paper, we study the impact of differences in personal traits of CEOs by looking at CEOs personal equity investments, which is entirely new information compared to previous literature. We expect the trading behavior of CEOs as a personal attribute in their investment decisions to directly impact their investment decisions for the firm they manage.

For this purpose we identify a new dataset and introduce share trading activity of CEOs and turnover of their personal share portfolios as novel factors that impact the risk level and sensation seeking behavior of CEOs and consequently the investment expenditure the firm they manage. These factors are more direct proxies of investment preference of CEOs compared to other variables used in the previous literature (Malmendier and Tate, 2005; Cronqvist, Makhaija and Yonker, 2012, Cain and McKeon, 2014). Malmendier and Tate (2005) suggest a theory that shows there is an association between investment preferences of CEOs for themselves and for their firms. We focus on this association and using our new factors show that there is an association between personal investment behavior of CEOs and their corporate investment decisions.

Based on the established understanding that stock market participation is negatively related to risk aversion (e.g. Vissing-Jørgensen and Attanasio, 2003), we hypothesize that CEOs who actively trade shares in their personal account are less financially conservative. We show that this trait is reflected in both their personal as well as corporate investment

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[2] More examples are Aktas, De Bodt and Roll (2009), and Frijns Gilbert, Lehnert and Tourani-Rad (2013) who present theoretical models which incorporate CEO risk aversion and predict that these CEO's characteristics have an impact on valuation outcomes and their bidding strategies decisions in mergers and acquisitions.

decisions. Furthermore, the literature attributes sensation seeking to higher levels of risk taking (Barber and Odean, 2001; Grinblatt and Keloharju 2009, Sunder and Zhang, 2014). We propose the magnitude of CEOs' personal share portfolio turnover as a proxy for sensation seeking and show that there is a relation between CEOs trading activity and their corporate investment expenditure.

To the best of our knowledge, this is the first study to relate personal trading activity of CEOs to their corporate investment decisions. We investigate this association by studying the personal trading activity for Finnish corporate CEOs who trade both their own firm's stock and the stocks of other firms over the period of 2005-2011. The sample is constructed using three datasets. The first is the Euroclear database, which contains trade-by-trade changes in all the shareholdings of every registered Finnish investor. The second database is the Finnish Insider Trading Registry (NetSire), which contains the insider transactions by directors of all firms listed on the Nasdaq OMX Helsinki Exchange. The third is the Public Registry of Incorporations (Virre), which contains directors' name and education.

We identify in 68 CEO accounts in Euroclear, by matching known insider trades from the Insider Trading Register with identical trades by anonymous account holders with the same year of birth in the Euroclear database. We then merge the Euroclear database with Virre to incorporate the name, the title and education of all CEOs. This unique dataset allows us, for the first time, to explore the complete share trading activity of CEOs, both in their own firm stock and the stocks of other firms.

We collect research and development, capital expenditure and business acquisitions expenditure data of corporations from their annual reports, and adopt the sum of these expenditures as our proxy for total investment. The results show that corporations with trader CEOs (who personally trade shares) invest more in capital expenditure and

business acquisitions. The results are robust after controlling for fixed industry, fixed year and firm clustered standard errors. These results are robust in logistic regressions which investigate the probabilistic outcome that firms engage in higher levels of investment. Controlling for fixed industry and year effects, trader CEOs contribute to the likelihood that firms engage in the highest tranche of total investment. We also investigate the impact of CEO portfolio turnover on the level of investment, and show that there is a positive correlation between CEO turnover rates and investments on business acquisitions.

Since in this study we use a non-random sample of CEOs with and without trader CEOs the results are prone to be affected by sample selection bias. Furthermore, there is a potential endogeneity between matching CEOs and firms as companies with higher investments may employ more risk averse i.e. trader CEOs. Therefore, it is necessary to construct an adequate control sample for comparison purposes, hence, avoid these biases in estimating effects of trader CEOs (treatment effect). We utilise propensity score matching (PSM) to efficiently match our treated sample (firms with trader CEOs) with control sample (firms without trader CEOs) based on multiple firm and CEO characteristics as well as industry and year dummies. The PSM methodology can address potential endogeneity problems associated with CEOs and their firms as well as the sample selection bias. We estimate PSM models based on different matching methods and show that our finding is robust after controlling for endogeneity and sample selection bias. Moreover, we show that our results are robust after controlling for CEO education as well as other proxies for corporate investments.

Our findings suggest that non-trading CEOs behave with a level of financial conservatism, which is reflected across both their individual and corporate domain. Within the trading CEOs those with higher portfolio turnover engage in more corporate investment, indicating that more trade activity is related to lower risk aversion.

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This paper is contributes to the literature that investigate the behavioral consistency theory which suggests CEOs exhibit similar behavioral traits across the individual and corporate domain. Graham, Harvey and Puri (2013) survey 1180 CEOs from both inside and outside of the U.S. and find that CEOs who are more risk tolerant are more likely to make acquisitions, and a larger number of acquisitions. Cain and McKeon (2013) analyze the corporate policies of CEOs in possession of a pilot's license and find that pilot CEOs are less risk averse in their corporate decisions and lead riskier firms. Hutton, Jiang and Kumar (2013) find that republican managers adopt more conservative corporate policies on average. Chyz (2013) finds that tax aggressive managers are positively associated with tax avoidance activities at their firm and also their firm's value.[3] In these studies, the individual preferences and values of CEOs are observed across various non-business domains, and are used to explain the variation in policies between firms. In this paper we enhance the current understanding of how key attributes in the business domain motivate CEOs to take on corporate investment. Ultimately, by developing a better understanding of what motivates investment expenditure, nomination committees will be able to leverage this knowledge when determining candidates for managerial positions.

The paper proceeds as follows. Section 2 presents the data and explains the construction of the variables. Empirical methods are explained in Section 3, and results are provided and discussed in Section 4. Section 5 offers concluding remarks.

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[3] A number of other studies find that top executives imprint a significant amount of their experiences and personal biases into their decisions and leadership behavior (Malmendier et al. 2005; Chatterjee and Hambrick 2007; Bamber, Jian, and Wang 2010). Bertrand and Schoar (2003) track top managers across different firms over time and find that the fixed effects of managerial leadership has a significant influence on investment, financial and organizational practices. They also show that executives from earlier birth cohorts appeared to be more conservative, while managers holding an MBA seemed to follow more aggressive strategies. Graham, Harvey and Puri (2013) survey 1180 CEOs from both inside and outside of the U.S. and find that CEOs who are more risk tolerant are more likely to make acquisitions, and a larger number of acquisitions.

2. Data and Variable Construction

2.1 Data

The data source in this study includes share transactions by CEOs across all companies listed on the Nasdaq OMX Helsinki Exchange during the sample period of January 1, 2005 to December 31, 2011. Individual share transactions for such as specific investor category are generally not readily accessible which makes our dataset particularly interesting.

Anonymous daily shareholding data were obtained from Euroclear Finland Ltd (formerly Finnish Central Securities Depository). The data from Euroclear Finland Ltd includes a time series of share holdings, and initial holdings for 1.06 million household investor accounts, with equity holdings in 191 different common stocks listed on the Nasdaq OMX Helsinki Exchange. In addition, the Euroclear Finland Ltd.'s dataset provides the date, price and volume for each investor specific trade by investor account. The database records are anonymous and each investor can only be identified by a unique number. This dataset allows us to accurately compute annual portfolio values and investment turnover ratios for individual investor accounts.

We also utilize the Finnish Insider Trading Registry (NetSire)[4] database to identify CEO trades. This dataset contains the insider transactions by directors of all firms listed on the Nasdaq OMX Helsinki Exchange. In addition we attained a complete list of CEOs of

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[4] The Finnish financial supervisory authority states the norms for how information on insider transactions are to be recorded and reported in Standard 5.3, Declarations of insider holdings and insider registers: Regulations and guidelines, Issued on 16 August 2005, Valid from 1 September 2005 until further notice, Changed on 22 September 2009 J. No. 4/120/2005. Most companies keep the public records of insider trades at Euroclear Ltd, while some keep these records at their premises and publish them on the corporation's website.

Finnish companies from the Public Registry of Incorporations "Patentti ja rekisterihallitus or Virre". This provides us with the CEOs name, title, education and the dates they joined and left the company. We identify CEO traders in Euroclear, by matching known insider trades from the Insider Trading Register with identical trades by anonymous account holders with the same year of birth in the Euroclear database. We then merge the Euroclear database with Public Registry of Incorporations to incorporate CEOs education and analyze all trades in CEO personal accounts.

We use the common equity transactions of CEOs in the merged dataset to determine the value of each CEOs portfolio at the start of each year, the number and value of transactions made each year, and the portfolio turnover rate each year. Furthermore, we supplement the CEO level data with CEO common stock holdings and stock option holdings within their own company, which have been hand-collected from annual company reports between 2005 and 2011. The resulting information about the current CEOs share trading activity is joined with the annual company level data and we discard any information about the CEOs identity. Our data collection and protection procedures strictly follow Finnish data protection law and related regulations, (reference Finnish Law: "Suomen Laki: Henkilötietolaki §14").[5] Annual company level data are hand-collected from company annual reports. Using key financial statements and financial notes, we obtain three investment costs; the annual amount spent on research and development, capital expenditure and business acquisitions. We supplement this with share price and shares on issue data from Standard and Poor's Compustat, and executive remuneration data hand-collected from annual reports.

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[5] We have consulted the Finnish data ombudsman in this matter to ensure that we strictly follow required principles in using such information for research purposes, and have received their recommendation for due procedure. Diary number: 324/41/13 dated March 1, 2013.

Unlike US firms listed on the NYSE, there is little information about the specific details of the stock options that executives hold in our sample. Consequently, we are unable to directly calculate the wealth sensitivity to these stock options. To address this, we follow Guay (1999) who take the number of stock options divided by the total number of shares as a proxy for the impact stock options may have on corporate innovation. Similar to Cain and McKeon (2014) and Sunder and Zhang (2014) we exclude financial institutions from the sample because these firms are highly leveraged. Additionally, we have excluded firms that have public information missing due to bankruptcy, merger or takeover.

The resulting sample includes 723 firm-year observations for the years 2005 to 2011 inclusive, where each firm-year observation contains the corporate investment data and information about the current CEOs share trading activity based on 202 different CEOs, of whom 68 trade shares in individual trading accounts. When the CEO changes we include information for the CEO with the longest tenure during the year of a change in CEO.

2.2. Variable Construction

In this paper, we investigate the relationship between trading behavior CEOs and corporate investments using a fixed effect regression analysis.

The investment cost variables are Research and development (R&D), capital expenditure and business acquisitions. We also define total investment as the sum of R&D, capital expenditure and business acquisitions. These proxies for corporate investments are consistent with prior empirical studies that have similarly focused on certain characteristics or situations and their influence on policy decisions (Malmendier and Tate,

2005; Cronqvist et al., 2012). We follow Agrawal and Mandelker (1981) and Armstrong and Vashishtha (2012) and divide all these investment variables by total assets to standardize them and ensure consistent factor analysis in our empirical investigation.

We define a binary variable that equals 1 if the CEO has an active personal trading accounts and 0 if she does not have any active account. We also define CEO portfolio turnover rate as the transaction value of all stocks purchased and sold divided by the average portfolio value of shares held during the year. We include transactions made in the CEO's firm in calculation of this variable, and winsorize it at the 90th percentile before being used in the regressions. We use a set of control variables at both CEO and company level which are common in the literature. The full list and definition of these variables are provided in Table 1.

Table 2 presents the distribution of CEOs who are classified as active traders. Panel A shows that each year, in average, 42.2% of CEOs had been active trader, and the percentage of trader CEOs decreases from 49.5% in 2006 to 30.8% in 2011. The number of active trader CEOs varies in different industries. Panel B demonstrates that technical industry has quite a small proportion of trading CEOs (21.4%) whereas transportation has a large proportion of trader CEOs (52.2%).

Table 3 tabulates the descriptive statistics for company (panels A and B) and CEO (panels C and D) related variables used in our regression analysis. For both company and CEO related variables, the statistics are computed over two subsamples: the first one includes firms without trader CEOs, and the second one includes those firms with trader CEOs.

Panel A shows that companies without trader CEOs invest in average more on capital expenditure (5.85%) than R&D (4.97%) and business acquisitions (1.96%). The statistics

for companies with trader CEOs (panel B) suggests similar allocations: these firms also invest more on capital expenditures (7.98%) follows with R&D (5.4%) and business acquisitions (2.97%). However, comparing Panels A and B reveals that firms led by trader CEOs have higher levels of all types of investments, compared to those without trader CEOs. The average total investment for firms run by trader CEOs is 16.35%, whereas the level of total investment for firms without trader CEO is 12.78%. T-statistics and Wilcox-Mann-Whitney statistics show that these differences in the levels of investments between firms without trader CEOs (Panel A) and the firms led by trader CEOs (Panel B) are significant at conventional levels. These descriptive statistics suggest that there is a relationship between trader CEOs and corporate investments that warrants further investigation.

In addition, both Panels A and B show that R&D and acquisitions variables are extremely skewed to the left. The reason is that not all firms in each subsample participate in R&D and business acquisitions. Moreover, statistics for company control variables in Panels A and B are relatively similar and statistical analysis shows no significant difference between the means and medians of these observations.

Panels C and D highlight that trader CEOs receive higher levels of financial remuneration ($413,921) compared to non-trader CEOs in other firms ($383,927). This suggests that financial compensation potentially influences corporate investment decisions. Interestingly, we do not find any statistically significant difference in executive stock options between these two groups. It is 0.0016 for firms without trader CEOs and 0.0015 for those with trader CEOs. This is in contrast with previous literature that suggests executive stock options are an effective risk-shifting mechanism. Furthermore, Panels C and D show that equity holdings (CEO ownership) and stock option holdings (options)

are extremely skewed to the left, suggesting that Finnish firms do not commonly utilize equity compensation in their compensation schemes.

Table 4, panel A illustrates the correlation between firm variables. The correlations between different types of investments are negative which is consistent with the intuition that increasing an investment of one type is associated with reducing investment in another type. There is a negative correlation between total investment and leverage (-0.114) as well as total assets (-0.288). However, the magnitude of these correlations are not significant. Table 4, panel B, reports the correlation between CEO variables. There is a negative correlation between age and being trader CEO (-0.066) as well as turnover (-0.030) suggesting that younger CEOs are more active in share trading. Moreover, there is a negative correlation between age and salary implying that in our sample younger CEOs are better compensated for their management skills, compared to older CEOs. Table 4, panel B, shows that trader CEOs are associated with higher salary compensation (correlation coefficient =0.038) and lower share (correlation coefficient =-0.033) and option compensations (correlation coefficient =-0.022).

3. Empirical Methods

In this paper, we investigative if firms led by trader CEOs invest more, compared with companies run by CEOs who do not trade shares. We examine three key measurable corporate investments: research and development (R&D), capital expenditure and business acquisitions. We also define total investment as the sum of R&D, capital expenditure and business acquisitions costs. All these variables are standardized by total assets.

Our basic regression model is based on the model used by Guay's (1999) and Tufano's (1996) to investigate how CEO's wealth sensitivity influences corporate investment decisions. We run the regression equation 1 over our entire sample.

$$CI_{it} = \alpha + \beta_1 T_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it},\qquad(1)$$

where CI_{it} is the value of corporate investment to total asset that is undertaken by firm i in year t and T_{it} represents an indicator variable that takes the value of 1 if the CEO of firm i is a trader in year t or 0 if she is not. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term.

We control for time-varying firm and CEO related characteristics that are common controls in the previous literature (Guay, 1999; Mehran, 1995; Coles, Daniel and Narveen, 2006). The CEO control variables used are salary, age, equity exposure and options exposure. The firm control variables are the natural logarithm of total assets, Tobin's Q and leverage.

We also consider how the turnover of CEOs personal share portfolio further affects corporate investment decisions. We expect CEOs with higher portfolio turnover to exhibit strategic policies with higher levels of corporate investment. This is based on the behavioral framework and prior literature that postulates investor portfolio turnover has relevant information concerning individual risk profiles. CEO trading activity also indicates the CEOs level of sensation seeking. We follow Barber and Odean (2001) and define the portfolio turnover of CEOs as the half of the total transaction value of all stocks purchased and sold by CEOs in a given year, divided by the portfolio value at the start of the year. To examine the relation between CEOs portfolio turnover and innovation, we replace the indicator variable for CEO trader in Model 1 with the CEO portfolio turnover variable for firm i in year t, F_{it}, to have the egression model 2 as follows.

$$CI_{it} = \alpha + \theta_1 F_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it},$$ (2)

In all our estimations of models 1 and 2 we control for fixed year effects, fixed industry effects and test significance in the coefficients using firm clustered standard errors.

We also utilize logistic regressions to investigate whether the probability that a CEO will invest in higher corporate investments is directly influenced by whether she is classified as a trader CEO or not. The alternative method to examine this probability is Linear Probability Model (LPM) approach. We employ logistic regression approach because first, the LPM doesn't account for structural parameters that are non-linear (Yim, 2013). Second, LPM generally estimates inconsistent results when there are only marginal effects (Ferris, Jayaraman and Sabherwal, 2013), and third, the logistic regression model is more efficient in providing non-biased estimators (Malmendier et al., 2008).

In order to perform logistic regression analysis we construct dependent variables that are dichotomous. We classify total corporate investment into three categories based on the proportion of total corporate investment to total assets. The first, the second, and the third categories include the firms for which the total investment is less than 5% , between 5-15%, and greater than 15% of total assets, respectively.

We analyze the probability of higher corporate investment and the effects of trader CEO using logistic equation model 3.

$$Pr(Z_{it}) = \frac{1}{1+e^{-(\beta_1 T_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it})}}$$ (3)

where T_{it} represents an indicator variable that takes the value of 1 if the CEO of firm i is a trader in year t or 0 if she is not. Z_{it} is an indicator variable that takes the value 1 for the category of total investment that we are investigating and 0 otherwise. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term.

We estimate logistic regressions three times for the three categories of total investment explained above. In all these regressions, we account for fixed industry and year effects and the significance of the estimated odds ratio coefficients are assessed with a Wald test.

4. Results and Discussion

Figures 1a, 1b, 1c and 1d illustrate a simple graphical analysis for R&D, capital expenditure, acquisitions and total investments, respectively. These figures also provide a year-by-year comparison that distinguishes CEOs who trade and CEOs classified as non-traders. In each figure, the measures for corporate investments are calculated by taking accounting values for R&D, capital expenditure and acquisitions and dividing it by the total assets for that calendar year. Scaling these measures by total assets enables comparability between different observations (Mehran, 1992, 1995; Lewellen, 2006).

Figure 1a does not indicate any distinct relationship between CEOs who trade shares and the amount of R&D CEOs undertake. Between 2005 and 2009 the average amount of R&D undertaken by non-trader CEOs is higher than the average amount of R&D undertaken by trader CEOs. However, in 2010 and 2011, the average R&D investment is higher for firms managed by trader CEOs, compared with firms led by non-trader CEOs. Figures 1b and 1c reveal more consistent relationship between investments by these firms and their CEOs as traders. Figure 1b illustrates that for all years (2005-2011), CEOs classified as traders engaged in higher levels of average capital expenditure compared to non-trader CEOs. Similarly, Figure 1c illustrates that the average value of acquisitions undertaken by trader CEOs is higher than the average value of acquisitions engaged in by non-traders except for in 2006 when one large merger by a firm with a non-trading CEO reverses the relation.

Figure 1d compares the average total investment between trader and non-trader CEOs. This figure indicates that on average, CEOs with trading accounts engage in higher levels of total corporate investment, compared to CEOs who do not trade. This is consistent with our hypothesis that trader CEOs will not be as financially conservative as non-trader CEOs.

4.1. Trader CEOs and Corporate Investments

Table 5 reports the results of estimations of regression equation 1 where CEOs are assigned an indicator variable, trader CEO, which takes the value 1, if they are share trader and 0 otherwise. There are four different specifications based on dependent variables employed in the regression. The dependent variables are R&D, capital expenditure, business acquisitions and total investment costs divided by the total asset. We control for industry and year effects and the reported standard errors are firm clustered.

In specification 1 (column 1) of Table 5, the estimated coefficient for trader CEO is positive but not significant at conventional levels. Consequently, no association between trader CEOs and the level of R&D can be inferred. However, the slope for salary is positive (0.2133) and significant (SE=0.0183) at 1% level. This provides further supports for the previous empirical results that show executive compensation (scaled by company revenue) is a key driver that motivates CEOs to take on higher levels of R&D.

Specification 2 (column 2) in Table 5 reports the impact of being a trader CEO on the amount of capital expenditure undertaken. The estimated coefficient for the trader CEO variable is 0.0173 and significant (SE=0.0102), suggesting that there is a positive

relationship between being a CEO that trades shares on her personal account and the amount of capital investment expenditure undertaken. This supports our postulation that CEOs who do not trade are more financially conservative compared to CEOs who do trade. Similar analysis is conducted for business acquisitions as the dependent variable. The results are summarized in specification 3 of Table 5 (column 3). The slope for trader CEO is 0.0107 and significant (SE= 0.0049) at 5% level, indicating a positive relationship between CEOs who trade, and the amount of acquisition expenditure undertaken. Business acquisition is considered as a risky investment. Our finding supports our hypothesis that CEOs who trade are less risk averse, hence, will take on more levels of risky corporate investments measured by the magnitude of business acquisitions.

Specification 4 (column 4) in Table 5 reports the main findings where the total investment is the dependent variable. The results support our hypothesis that trader CEOs will be less financially conservative with regards to corporate investment. The estimated coefficient on trader CEO is 0.0235, but insignificant (SE=0.0196) at conventional levels. The insignificant result might be due to the value of R&D investment. Table 3 panel B shows that R&D investments (5.4%) are about double of business acquisition investments (2.97%) and about one-third of the total investment (16.35%).

In summary, Table 5 demonstrate that the trait of financial conservatism is consistent across both CEO investing patterns and corporate acquisition and long-term (capital expenditure) investing decisions. CEOs who do not trade are more likely to be financially conservative, and this is reflected empirically through the positive relationship between trader CEOs and the amount of corporate investment they engage with.

4.2. The Probability that Trader CEOs Invest More

We further use the logistic regression method to examine whether trader CEOs take on higher levels of corporate investment. The use of logistic regressions allows us to model the probability of specific ranges of total corporate investment as a proportion of total assets. These ranges are less than 5% , between 5% to 15%, and greater than 15% of total assets. The logistic regression provides estimations for odds ratios and Wald statistics. An odds ratio greater (less) than 1 would indicate a positive (negative) effect on corporate investment. We estimate regression equation 3 using the trader CEO as a binary variable that takes the value of 1 if the CEO is trader and 0 otherwise. We use the same firm and CEO control variables as in regression equation 1.

Table 6 presents the results. The estimates for specification 3 (column 3) demonstrate a significant positive association between trader CEOs and the probability of a firm undertaking total corporate investment greater than 15% of total assets (odds ratio is 1.4230 and significant at 10%). This result provides further support for the conjecture that CEOs who trade are less financially conservative. Moreover, the results for the specification 1 (column 1) show that there is a negative relationship between trader CEOs and the probability of firms taking on corporate investment less than 5% of total assets (odds ratio is 0.4840 and significant at 1%). This finding is consistent with the postulation that CEOs who do not trade shares are more financially conservative in their corporate investment decisions.

These results show that trader CEOs significantly contribute to the probability that firms undertake higher percentages of corporate investment. This is consistent with previous literature that shows confident CEOs to seek out more investment opportunities (Brown and Sarma, 2007), while risk-averse CEOs tend to be less risk seeking (Malmendier and Tate, 2008).

4.3. CEO Portfolio Turnover and Corporate Investment

In this section, we examine the association between turnover of CEO's personal share portfolio and corporate investment. Previous research demonstrates that portfolio turnover of a trader represents her overconfidence and risk-seeking traits. In this paper, the aim is to establish whether CEOs with higher share portfolio turnover, engage in higher levels and possibly riskier forms of corporate innovation. Guay (1999) and Armstrong and Vashishtha (2012) for example emphasize that R&D and business acquisitions contribute greater volatility in firm performance relative to capital expenditure.

We estimate regression Equation 2 to examine the effect of CEO portfolio turnover on the value of corporate investments. We control for company and CEO related variables as well as fixed year and industry effects, and use firm clustered standard errors. Table 7 reports the results. The estimate of the CEO portfolio turnover in specification 1 (column 1) is 0.0312 and insignificant (SE=0.0284), suggesting there is no association between portfolio turnover and the amount of R&D engaged by firms.

Specification 2 (column 2) of Table 7 demonstrates the estimates of the regression when we use capital expenditure as the dependent variable. Unlike R&D, capital expenditure is considered a less risky form of corporate innovation. Nevertheless, Coles, Daniel and Naveen (2006) argue that capital expenditure has certain proportions of risk and uncertainty. Specification 2 shows that there is a positive coefficient estimate for the portfolio turnover, but it is insignificant at conventional levels.

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The literature has shown that business acquisitions are riskier forms of innovation that adds idiosyncratic risk towards firms (Armstrong and Vashishtha 2012). In specification 3 (column 3), business acquisition is the dependent variable. The results indicate that CEO portfolio turnover is significantly positively (the slope is 0.0052) related to the amount spent on business acquisitions. Interestingly, there is a negative relationship (slope= - 0.0015) between age and the level of investment on business acquisitions. These two observations have two implications. Firstly, the negative relationship with age implies that younger CEOs likely engage in more acquisition activity. This suggests that younger CEOs are more risk seeking when it comes to their strategic investment decisions. The results also indicate that CEOs with higher portfolio turnover rates participate in riskier forms of corporate investment (business acquisitions). In the context of behavioral consistency theory, these results support the conjecture that overconfidence and risk-seeking sensations are traits that are translated across personal and corporate investment decisions.

We finally take the total investment as the dependent variable and report the estimates in specification 4 of Table 7. The slope for CEO portfolio turnover is positive but insignificant at conventional levels. This result is similar to our finding in the previous section where we find there is not significant association between being a trader CEO and the level of total investment.

We suggest that high portfolio turnover induces CEOs to adopt riskier forms of corporate investment. This is based on the notion that high portfolio turnover is representative of sensation seeking in both the personal and the corporate domain. A possible alternative explanation is that trader CEO variables may capture CEOs with greater managerial abilities. Thus, the higher level of investment may be attributed to managerial ability as opposed to sensation seeking. Behavioral studies on sensation seeking (Zuckerman, 1971;

Malmendier and Tate, 2005) have shown that sensation seeking follows a negative quadratic form. As individuals our appetite towards sensation seeking increases until an individual hits adolescence, from there on their perception towards sensation seeking decreases over time. Conversely managerial ability is built up over a person's career. As such, if CEO turnover is representative of sensation seeking, we would expect to see CEO age negatively correlated to the level of corporate investment. In contrast, if CEO turnover was capturing managerial ability, we would expect to see a positive relationship with age. Our empirical results indicate that CEO age is negatively related to the level of investment on business acquisitions (column 3, Table 7). When we examine business acquisitions, the coefficient for age is -0.0009 (SE=0.0003) and significant at 1% level. This strongly supports the notion that portfolio turnover captures sensation seeking as opposed to managerial ability.

4.4. Endogeneity and Robustness Tests

4.4.1. Endogeneity: CEOs and their Firms

Endogenous matching of CEOs and firms is an important alternative explanation to the positive association between trader CEOs and corporate investment. Kaplan, Klebanov and Sorensen (2012), for example, argue that CEO traits and characteristics are reflective of the firms they work in. Thus, less risk averse and possibly sensation seeking CEOs are likely to be hired by firms that engage in more investment. This poses the question whether this positive relationship is being driven by sensation seeking traits or by the environment the CEO is placed in. In Table 5, we have already attempted to control this issue, partially, by including fixed industry and year effects into all of our estimations, as

well as computing firm clustered standard errors. Controlling for fixed effects and particularly for firm clustering decreases the significance of our estimates[6]. This difference in effect between unadjusted and controlled estimations supports the notion that there is an endogenous matching effect that partly, but not fully, explains the association between CEO trading activities and investment.

Nevertheless, evaluating this relation without controlling for this potential endogeneity directly could make our empirical analysis unreliable. Moreover, since we investigate non-random sample of CEOs, it is necessary to construct an adequate matching sample for comparison purposes, so as to avoid bias in estimating treatment (CEO being trader) effect. In this study, we propose to use the Propensity Score Matching (PSM) method as an attractive solution to our endogeneity problem as well as sample selection bias. In addition to controlling for the endogeneity of CEOs and firms matching, the PSM approach makes it possible to efficiently match several factors in constructing an adequate control sample and avoid potential selection bias in treatment effects.[7]

To evaluate the effect of trader CEOs on corporate investment, we would ideally estimate the Average Treatment Effect on the Treated (ATET) sample, as the difference between the outcomes (i.e. higher corporate investment) of treated (i.e. if the firm has trader CEO) and outcomes of the treated observations if they had not been treated. More formally the ATET is defined as below.

$$ATET = E(CI_{1i}/X_i, T_i = 1) - E(CI_{0i}/X_i, T_i = 1) \qquad (4)$$

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[6] The estimates without industry and firm fixed effects are significant at conventional levels, but have not been reported in the paper. These results are available upon request.

[7] Matching firms based on few factors is unlikely to be sufficient to eliminate the bias. Also using traditional sequential matching techniques that take into account for all the important factors associated with corporate investments is very inefficient.

where

CI_{1i} : corporate investment of firm *i* with trader CEO

CI_{0i} : corporate investment of firm *i* without trader CEO

T_i : 1 if the firm *i* have trader CEO, 0 otherwise

X_i : firm *i* characteristics

However, the second term in equation 4 is a counterfactual so it is not observable and needs to be estimated. Rosenbaum and Rubin (1983) show that, the ATET can be estimated as follows:

$$ATET = E(CI_{1i}/p(X_i), T_i = 1) - E(CI_{0i}/p(X_i), T_i = 0) \qquad (5)$$

where the propensity score $(p(X_i))$ is defined as the conditional probability of receiving the treatment (trader CEO) given a firm's pre-treatment characteristics (X_i). The estimation of the ATET follows a two-step process. First, we use the following probit model and estimate the propensity scores for all the firms in the sample.

$$pr(T = 1/X_i) = E(T = 1/X_i) \qquad (6)$$

The firm's pre-treatment characteristics (X_i) or matching variables are Salary/REV, Common Share Ownership (%), Option Share Ownership (%), Log Total Assets, Tobin's Q, Leverage, and industry and year dummies

Second, using these propensity scores, firms receiving treatments are matched with a control group (that has not received the treatment). There are several alternative techniques for propensity score matching. The most common ones are "nearest neighbor matching", "stratification matching", "kernel matching" and "radius matching". Appendix A provides details of these methods. Since these matching techniques involve tradeoffs between the number of matches and the quality of matching, and none of them has clear advantage to the others, we employ all these methods to estimate equation 5.

Table 8 reports ATET estimates of firm's various corporate investments based on four different PSM techniques: nearest neighbor, kernel, stratification and radius.

We find that trader CEOs are associated with more capital expenditure, business acquisitions investments and total corporate investments. PSM estimates show that there is no statistically significant association between R&D investment and trader CEOs. These results support our previous findings and are robust to isolating industry and year effects as well as controlling for firm and CEO control variables. In fact the PSM results are stronger than our previous analysis, indicating that firms with trading CEO are also likely to invest more on capital expenditure in addition to making more business acquisitions. Hence the evidence presented in the previous sections and the PSM results suggest that lower risk aversion and sensation seeking traits of CEOs explains higher level of investments in addition to the effect of initially choosing of such CEOs for investment-intensive firms.

4.4.2. Robustness Tests

We test the robustness of our results by adding more control variables into our regression models. Studies by Betrand and Schoar (2003) suggest that CEOs educational background

has noteworthy implications on their corporate investment decisions. They find that CEOs with MBAs have greater appetites towards risk. We control for CEOs educations in regression equations 1 and 2. The results are summarized in Tables 10 and 11. In Table 9, the results exploring the linkages between trader CEOs and corporate investments are similar to those reported in Table 5. Table 10 shows that the addition of CEO education controls make the results stronger, compared to those reported in Table 7. The slope of CEO portfolio turnover when we use business acquisition and total investment as dependent variables are now significant at 1% level (Table 10, columns 3 and 4). Furthermore, there is a positive relation between CEO portfolio turnover and R&D as the riskier forms of corporate investment. An interesting result is that across all models, holding an MBA (Finance degree) has a positive (negative) impact on the level of corporate investments.

Moreover, our empirical analysis focuses on using corporate investments scaled by total assets as the key dependent variables (e.g. R&D/total assets). This measurement allows for greater comparability between firms (Mehran, 1992, 1995; Rajgopal and Shevlin, 2002; Lewellen, 2006). However, Sunder and Zhang (2014) use the *natural log* of total investment as their dependent variable in their analysis. As a further robustness test, we re-run our regression equations 1 and 3 using natural log of our variables for investments. The results reported in the Appendix B (Tables B-1 and B-2) are stronger compared to those reported in Tables 7 and 9.[8]

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[8] For example the CEO portfolio turnover results (Table B-2, columns 1, 3 and 4) have higher significance than those in Table 7 indicating a positive relation CEO portfolio turnover to the more risky forms of innovation, R&D and Acquisitions at the 1% significance level. Also the estimates of trader CEO for the total investment (Table B-1, column 4) is significant at 1% level, compared to insignificant results reported in Table 5, column 4.

4.5. CEO Compensation, Financial Crisis and Corporate Investment

We provide evidence that firms with CEOs who trade shares exhibit significantly higher levels of corporate investment. Interestingly, across all regression models, stock options fail to register any significant influence in motivating corporate investments. This contradicts the literature (Defusco Johnson and Zorn, 1990; Mehran, 1995; Tufano, 1996) which suggests that equity compensation can be utilized to encourage managers to take on more risk. However, studies that explore equity compensation as a risk-shifting mechanism has focused on US firms. Fernandes, Ferreira, Matos, and Murphy (2013) highlight that the compensation structure between American companies and European companies are significantly different. They show that for an average firm is US (Europe), equity-based compensation contributes approximately 40.4% (20.6%) of total compensation. This is further highlighted in our descriptive statistics (Table 3, Panels C and D) which illustrates strong skewness to the left for the stock option variable. This potentially explains why the results show that stock options are insignificant in motivating corporate innovation.

Additionally, our results in Tables 7 and 9 show that there is a positive association between CEO's salary and R&D, business acquisitions, and total investments (columns 1, 3 and 4). This suggests that financial remuneration representing the largest proportion of compensation is correlated with corporate investments. This implies that the magnitude of financial remuneration, as a risk-shifting mechanism, rather than stock options, motivates CEOs to take on riskier forms of corporate investments in this sample of European firms. It appears that our finding that behavioral traits of CEOs are consistent

across both individual and corporate investment decisions is not driven by the difference in executive compensation between the investigated firms and US firms.

Finally, we investigate the association of personal trading behavior of CEOs and their corporate investment decisions during the 2007/2008 financial crisis. Ivashina and Scharfstein (2010) show that lending to corporations for new investments significantly decreased during the crisis. This extreme reduction in availability of investment capital has been attributed to that investors had to rapidly withdraw from wholesale money market. Moosa (2010) shows that the crisis escalated to such extreme conditions largely due to deficiencies in bank regulation. We expect corporate investment decisions to be particularly dependent on the risk aversion of the CEOs during a period when the availability of investment capital disappears, and investments largely have to be financed internally. We estimate similar regression models as in Table 5, with an extra control, an interaction variable that incorporates the year 2008 as the most important crisis year, globally and in Finland. This control variable is the interaction of the indicator variables for year 2008 and trader CEOs. The impact of the trader CEOs indicator on corporate investments is significantly greater during the crisis year, indicating that the difference in corporate investment levels between trader and non-trader CEOs is greater during the crisis[9]. This finding indicates that the choice of CEO personality is particularly important for the behavior of a firm during extreme events. Shareholders will be able to better align the CEOs preferences with their own at crucial turning points for a firm's development, by taking the CEOs own investment behavior into consideration as a criteria when selecting a new or a re-electing an incumbent CEO.

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[9] These results are not reported in the paper, but available from the authors on request.

5. Conclusion

In this paper, we set out to investigate whether certain behavioral traits of CEOs, such as financial conservatism and sensation seeking, are consistent across both individual and corporate investment decisions. This paper is motivated by the emergence of behavioral consistency theory in explaining managerial preferences and strategic decisions through specific behavioral qualities.

We investigate how personal financial risk exposure of the CEO affects their firm's investment value on research and development, capital expenditure and business acquisitions. We find a significant and robust positive association for capital expenditure and business acquisitions, is the latter being the category of corporate investments that is most tightly controlled by the CEO. For the research and development variables (clearly positively related to the trader CEO variable and CEO portfolio turnover in univariate analysis), we do not yield significant results when controlling for fixed year and industry effects and using firm clustered standard errors. Besides enhancing the current understanding of what motivates firms to invest more, the broader contribution of this paper highlights how financially conservative CEOs maintain their personal conservative attitude in their firms and consequently in their corporate investment decisions. Interestingly the difference in corporate investment levels between trader and non-trader CEOs is greater during the 2007/2008 financial crisis, indicating that personal traits of CEOs are particularly important for how a firm is managed through crisis.

We also explore the suggestion that sensation seeking results in riskier forms of corporate investments. Our results show that CEOs with higher portfolio turnover, invest more in business acquisitions. This supports the existing literature which argues risk-averse managers avoid risky projects such as corporate acquisitions.

Prior research focuses on how compensation structures encourage risk-taking activities (Tufano, 1996; Guay 1999; Ross, 2004). Executive stock options have long been seen as the most effective risk-shifting mechanism. However, after accounting for risk averseness factors, trader CEOs and CEO portfolio turnover, equity compensation is not significantly related to the level of corporate investment in our sample.

We use PSM methodology to address the concerns about a sample selection bias and the potential endogeneity where less risk averse CEOs are hired by firms which invest more. We show that endogenous matching does not affect our results with regards to the association between trader CEOs and corporate investments. In this paper, we enhance common understanding of behavioral characteristics and their implication on corporate policy. The main implication is that shareholders are better informed on what specific traits and characteristics to look for in their potential CEOs. Shareholders can leverage on this knowledge, allowing them to closer align managerial preferences with their own. Ultimately, this could potentially result in more effective corporate decisions.

Appendix A: PSM Matching Methods

This Appendix provides a brief explanation from Heckman et al. (1997, 1998) for the four propensity score matching estimators used in this paper.

Nearest neighbor matching: in this method, each treated observation is matched with the control observation that has the closest propensity score. A possible disadvantage of this method is that some matches might be poor because the neighbor may have a very different propensity score.

Kernel matching: in this estimator, for each treated observation, the weighted average of all control observations are used. The weights are inversely proportional to the distance between the propensity scores of the treated and control observations. Therefore, we have an average number with high weights on the observations with closest match and very low for the observations with farther match. This method does not have the disadvantage of the nearest neighbor estimator mentioned above.

Stratification matching: in this method, which is very common, both treated and control observations are divided into several blocks based on their propensity scores. Then the treated observations are matched with control observations within each block. Then the average treatment effect on the treated (ATET) is the weighted average of the individual ATETs from each block.

Radius matching: this estimator is similar to the nearest neighbor, but each treated observation is matched with control observations with propensity scores within the specified radius around the closest propensity score.

Appendix B: Regression results with natural log of proxies for corporate investment

Table B-1: The table reports the results of the following time-series regression.

$$CI_{it} = \alpha + \beta_1 T_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it},$$

where CI_{it} is corporate investment variable that is undertaken by firm i in year t and T_{it} represents a dummy variable that takes the value of 1 if the CEO of firm i is an active trader or 0 if she is not. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term. The corporate investment variable is the natural logarithm of investments on R&D, capital expenditure and business acquisitions, and total investment (as the sum of magnitudes of investments on R&D, capital expenditure and business acquisitions). All of these variables are scaled by total assets of firm i for year t. CEO and firm control variables are defined in Table 1. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market. Standard errors clustered at the firm level are shown in parentheses. ***, ** and * denote statistical significance at a 1%, 5% and 10% level, respectively.

Dependent Variable	Research and Development	Capital Expenditure	Business Acquisition	Total Investment
Intercept	5.2922	-3.9521***	-34.9561***	-1.2074
	(6.7912)	(0.9749)	(3.8118)	(1.2031)
Trader CEO	0.3405	0.3074**	1.5332*	0.3084**
	(1.1607)	(0.1441)	(0.8626)	(0.1298)
CEO Controls				
Salary/REV	-0.2504	-0.2622	3.4165***	0.5057***
	(0.6138)	(0.1793)	(0.4521)	(0.1035)
Common Share Ownership (%)	0.3127**	0.0168	-0.0258	0.0312
	(0.1239)	(0.0183)	(0.0786)	(0.0213)
Option Share Ownership (%)	-3.9963	-9.9928	29.2505	-6.3504
	(110.5509)	(7.4881)	(57.9555)	(16.3600)
Age	-0.1240	0.0141	-0.0872*	0.0024
	(0.0790)	(0.0095)	(0.0480)	(0.0110)
Firm Controls				
Log Total Assets	0.7506**	1.0012***	2.4143***	0.9321***
	(0.3022)	(0.0409)	(0.1904)	(0.0437)
Tobin's Q	0.3008*	0.0354	0.1275	0.0237
	(0.1662)	(0.0248)	(0.1164)	(0.0307)
Leverage	-1.5800**	-0.0704***	-0.8799***	-0.2147***
	(0.5388)	(0.0730)	(0.4153)	(0.0716)
Fixed Industry Effects	Yes	Yes	Yes	Yes
Fixed Year Effects	Yes	Yes	Yes	Yes
Firm Clustered Std Errors	Yes	Yes	Yes	Yes
Number of Observations	723	723	723	723
Number of firms	107	107	107	107
Adjusted R-Square	0.2291	0.7954	0.3282	0.7779

Table B-2: The table reports the results of the following time-series regression.

$$CI_{it} = \alpha + \theta_1 F_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it},$$

where CI_{it} is corporate investment variable that is undertaken by firm i in year t, and F_{it} is the portfolio turnover variable for CEO of firm i in year t. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term. The corporate investment variable is the natural logarithm of investments on R&D, capital expenditure and business acquisitions, and total investment (as the sum of magnitudes of investments on R&D, capital expenditure and business acquisitions). All of these variables are scaled by total assets of firm i for year t. CEO and firm control variables are defined in Table 1. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market. Standard errors clustered at the firm level are shown in parentheses. ***, ** and * denote statistical significance at a 1%, 5% and 10% level, respectively.

Dependent Variable	Research and Development	Capital Expenditure	Business Acquisition	Total Investment
Intercept	4.9743	-3.8321***	-34.6325***	-1.2713
	(6.6698)	(1.0043)	(4.0674)	(1.1823)
CEO Portfolio Turnover	0.0200***	0.0005	0.0145***	0.0085***
	(0.0051)	(0.0007)	(0.0033)	(0.0008)
CEO Controls				
Salary/REV	-0.2750	-0.2288	3.5458***	0.5140***
	(0.6261)	(0.1829)	(0.4567)	(0.1016)
Common Share Ownership (%)	0.3119***	0.0109	-0.0516	0.0277
	(0.1160)	(0.0179)	(0.0782)	(0.0199)
Option Share Ownership (%)	-3.0769	-10.1720	29.0379	-6.0733
	(112.6812)	(7.6331)	(65.1153)	(18.2601)
Age	-0.1261	0.0123	-0.0962*	0.0006
	(0.0784)	(0.0092)	(0.0497)	(0.0107)
Firm Controls				
Log Total Assets	0.7771**	1.0054***	2.4486***	0.9453***
	(0.3068)	(0.0422)	(0.1955)	(0.0432)
Tobin's Q	0.3187*	0.0393	0.1550	0.0332
	(0.1633)	(0.0259)	(0.1194)	(0.0288)
Leverage	-1.5921**	-0.0685***	-0.8788***	-0.2186***
	(0.5421)	(0.0744)	(0.4114)	(0.0729)
Fixed Industry Effects	Yes	Yes	Yes	Yes
Fixed Year Effects	Yes	Yes	Yes	Yes
Firm Clustered Std Errors	Yes	Yes	Yes	Yes
Number of Observations	723	723	723	723
Number of firms	107	107	107	107
Adjusted R-Square	0.2308	0.7913	0.3206	0.7774

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Figure 1: Corporate Investments by Trader CEOs and Non-Trader CEOs

Figure 1a, 1b, 1c & 1d provides a year by year graphical representation of the average R&D, capital expenditure, business acquisitions & total investments as proportion of total assets. Firms with CEOs who trade shares (trader, light bars) are contrasted to firms with CEOs who do not trade shares (Non Trader, dark bars). The variables are defined in Table 1. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market.
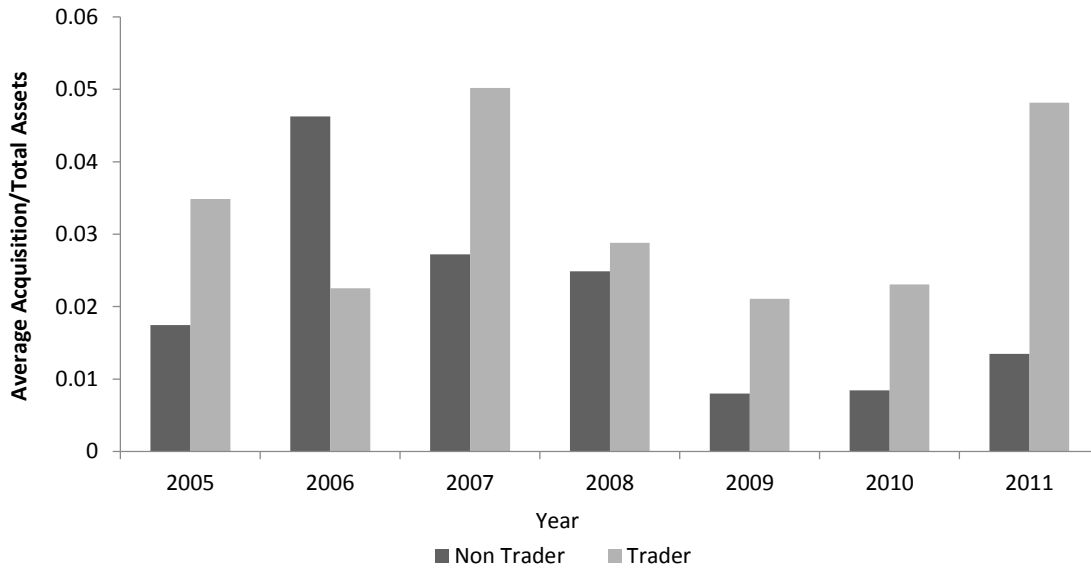
1a)
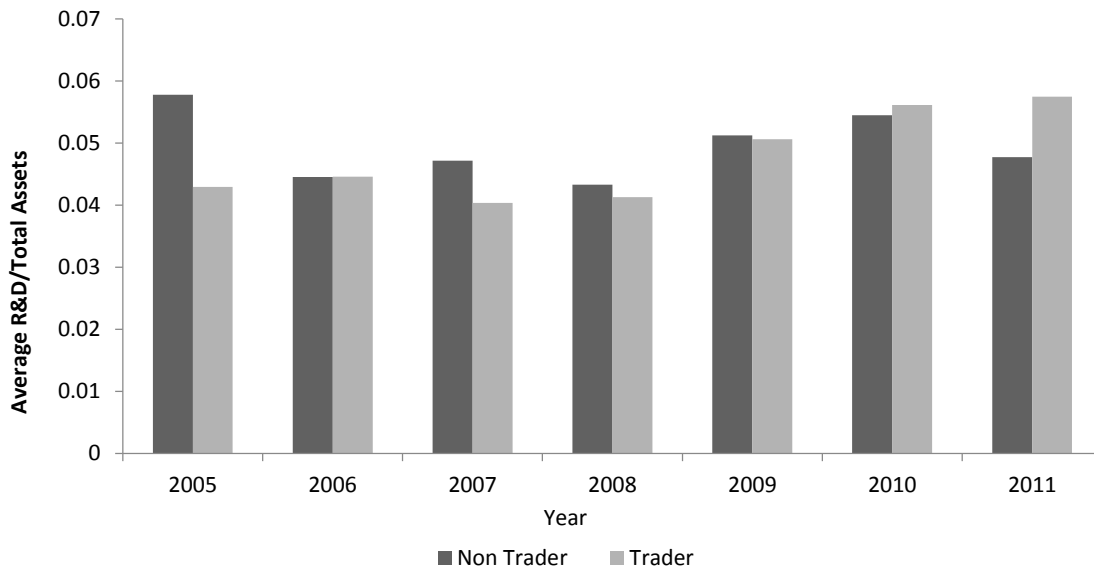
1b)

Figure 1: Corporate Investments by Trader CEOs and Non-Trader CEOs (**Cont'd**)
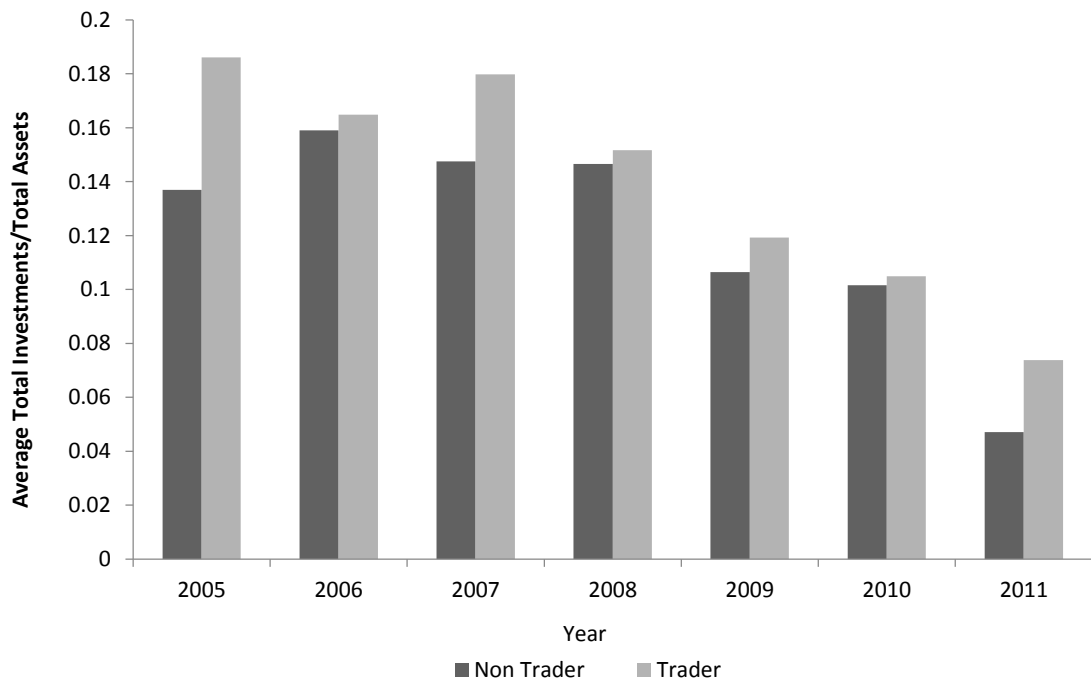
1c)

1 d)

Table 1: Variable Definitions

This Table provides all the variable definitions that are used in this empirical study. Panel A contains the variable definitions for the dependent variables used in regression analysis. Panel B provides the definitions of company variables. In Panel C, CEO variables are defined.

Panel A: Dependent Variables	
R&D/Total Assets	*The total value of research and development completed by the firm during a particular year, divided by the total value of assets*
CAPEX/Total Assets	*The total value of capital expenditure completed by the firm during a particular year, divided by the total value of assets*
Acquisition/Total Assets	*The total value of business acquisitions completed by the firm during a particular year, divided by the total value of assets*
Total Investments/Total Assets	*The total value of research and development, capital expenditure and business acquisitions completed by the firm during a particular year, divided by the total value of assets*
Panel B: Company Variables	
Leverage	*Book value of total liabilities divided by the market value of equity*
Log Total Assets	*The natural logarithm of the book value of total assets*
Tobin's Q	*The market value of equity and liabilities divided by the book value of total assets*
Industry-Manufacturing	*Binary variable that equals one if the firm is classified into the manufacturing industry*
Industry -Technical	*Binary variable that equals one if the firm is classified into the technical industry*
Industry –Trade	*Binary variable that equals one if the firm is classified into the trading industry*
Industry -Transport	*Binary variable that equals one if the firm is classified into the transport industry*
Industry -Service	*Binary variable that equals one if the firm is classified into the service industry*
Panel C: CEO Variables	
Trader CEO	*Binary variable that equals 1 if the CEO has an active personal trading accounts*
CEO Portfolio Turnover	*The transaction value of all stocks purchased and sold divided by the average portfolio value of shares held during the year. This includes transactions made in the CEO's firm. The variable is winsorized at the 90th percentile before being used in the regressions.*
Income	*Sum of CEO base salary, performance bonuses allowances and non-cash benefits*
Salary/Rev	*Sum of CEO base salary divided by the total revenue of the firm*
CEO Ownership	*Total shares owned by the CEO in their own firm divided by the total number of shares outstanding*
Options	*Total number of executive stock options held by the CEO divided by the total number of shares outstanding*
Finance Education	*Binary variable that equals 1 if the CEO has an finance education background*
Technical Education	*Binary variable that equals 1 if the CEO has an technical education background*
MBA	*Binary variable that equals 1 if the CEO has an MBA*
Advanced Degree	*Binary variable that equals 1 if the CEO has an advanced degree*

Table 2: CEO Year and Industry Distribution

This table provides the breakdown of the number of CEOs, number of Trader CEOs, and the percentage of Trader CEOs. Panel A provides the sample by year and Panel B provides the sample by industry excluding financial firms. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market.

Panel A: Distribution by Year			
Year	No. of CEOs	No. Trader CEOs	Trader CEOs (%)
2005	96	37	38.54
2006	99	49	49.49
2007	103	50	48.54
2008	105	50	47.62
2009	106	46	43.40
2010	107	40	37.38
2011	107	33	30.84
Total	723	305	42.19

Panel B: Distribution by 5 key Industry Groups			
Industry	No. of CEOs	No. Trader CEOs	Trader CEOs (%)
Manufacturing	397	169	42.57
Technical	28	6	21.43
Trade	49	19	38.78
Transportation	46	24	52.17
Service	203	87	42.86
Total	723	305	42.19

Table 3: Descriptive Statistics

This table provides the descriptive statistics for all the variables used in regression analysis. Panel A contains the descriptive statistics for dependent variables and company control variables for all firms. Panel B contains the descriptive statistics for these variables computed over a subsample that includes the firms with trader CEOs. Panel C provides the descriptive statistics for CEO variables for all firms. Panel D reports the descriptive statistics for CEO variables computed over a subsample that includes the firms with trader CEOs. The **bold** and underlined coefficients in Panel B and Panel D represent significance at the 5% and 10%, respectively, based on *t*-tests (Wilcoxon-Mann-Whitney tests) conducted to test for differences between means (medians) for firms with trader CEOs and all firms. The variables are defined in Table 1.

Panel A: Company Variables- Firms without Trader CEOs (418 Firm Years)						
Variable	N	Mean	25th Percentile	Median	75th Percentile	Std Dev
Dependent Variables						
R&D/Total Assets	418	0.0497	0.0000	0.0089	0.0387	0.1040
CAPE/Total Assets	418	0.0585	0.0225	0.0384	0.6871	0.0656
Acquisitions/Total Assets	418	0.0196	0.0000	0.0000	0.0147	0.0466
Total Investments/Total Assets	418	0.1278	0.0476	0.0823	0.1788	0.1253
Company Controls						
Leverage	418	0.5617	0.0849	0.2918	0.6744	0.8252
Log Total Assets	418	19.2995	17.8096	18.8899	20.7736	1.9736
Tobin's Q	418	2.0729	1.0400	1.6500	2.8500	1.8528
Industry						
-Manufacturing	418	0.5454	-	-	-	-
-Technical	418	0.0526	-	-	-	-
-Trade	418	0.0717	-	-	-	-
-Transport	418	0.0526	-	-	-	-
-Service	418	0.2775	-	-	-	-

Panel B: Company Variables- Firms with Trader CEOs (305 Firm Years)						
Variable	N	Mean	25th Percentile	Median	75th Percentile	Std Dev
Dependent Variables						
R&D/Total Assets	305	<u>0.0540</u>	0.0000	<u>0.0131</u>	0.0348	0.1987
CAPE/Total Assets	305	<u>0.0798</u>	0.0280	0.0515	0.0942	0.0907
Acquisitions/Total Assets	305	0.0297	0.0000	0.0193	0.2240	1.0463
Total Investments/Total Assets	305	0.1635	0.0632	<u>0.1039</u>	0.1824	0.2378
Company Controls						
Leverage	305	0.5886	0.0926	0.3042	0.6153	0.9914
Log Total Assets	305	19.3977	17.8142	19.2575	21.0598	2.0353
Tobin's Q	305	2.2097	1.1600	1.7300	3.0300	2.6536
Industry						
-Manufacturing	305	0.5526	-	-	-	-
-Technical	305	0.0197	-	-	-	-
-Trade	305	0.0625	-	-	-	-
-Transport	305	0.0789	-	-	-	-
-Service	305	0.2862	-	-	-	-

Panel C: CEO Variables- Firms without Trader CEOs (418 Firm Years)

Variable	N	Mean	25th Percentile	Median	75th Percentile	Std Dev
Age	418	50.5717	46.0000	50.0000	56.0000	6.4541
Income ($)	418	383927	194317	309682	515413	256387
CEO Ownership	418	0.0955	0.0000	0.0005	0.0080	1.1474
Options	418	0.0016	0.0000	0.0000	0.0008	0.0057
Finance Education	418	0.4713	-	-	-	-
Technical Education	418	0.4234	-	-	-	-
MBA	418	0.1818	-	-	-	-
Advanced Degree	418	0.7632	-	-	-	-

Panel D: CEO Variables- Firms with Trader CEOs (305 Firm Years)

Variable	N	Mean	25th Percentile	Median	75th Percentile	Std Dev
Age	305	49.7377	46.0000	49.0000	53.0000	6.0079
Income ($)	305	413921	219630	354000	554274	272080
CEO Ownership	305	0.0364	0.0001	0.0004	0.0029	0.1100
Options	305	0.0015	0.0000	0.0000	0.0019	0.0027
Finance Education	305	0.5311	-	-	-	-
Technical Education	305	0.3607	-	-	-	-
MBA	305	0.1115	-	-	-	-
Advanced Degree	305	0.8754	-	-	-	-

Table 4: Pearson Correlations

This table presents the Pearson correlation coefficient for dependent and firm control variables (panel A) and CEO variable (panel B). The variables are defined in Table 1. The **bold** and <u>underlined</u> coefficients represent significance at the 5% and 10%. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market.

Panel A: Pearson Correlations for Firm Variables

	R&D/Total Assets	Capex/Total Assets	Acquisition/ Total Assets	Total Investments/ Total Assets	Leverage	Log Assets	Tobin's Q
R&D/Total Assets	1.000						
Capex/Total Assets	<u>-0.067</u>	1.000					
Acquisition/ Total Assets	<u>-0.069</u>	-0.010	1.000				
Total investment/ Total Assets	0.827	0.123	0.557	1.000			
Leverage	-0.101	0.084	-0.053	-0.114	1.000		
Log Assets	-0.307	0.197	-0.059	-0.288	0.161	1.000	
Tobin's Q	0.042	-0.013	-0.011	0.028	-0.011	-0.044	1.000

Panel B: Pearson Correlations for CEO Variables

	Shares/Total Shares	Options/Total Shares	Trader	CEO Portfolio Turnover	Salary/ Rev	Age
Shares/Total Shares	1.000					
Options/Total Shares	-0.022	1.000				
Trader	-0.033	-0.008	1.000			
CEO Portfolio Turnover	-0.002	0.002	<u>0.066</u>	1.000		
Salary/Rev	0.003	-0.003	0.038	0.023	1.000	
Age	-0.080	-0.083	<u>-0.066</u>	-0.030	<u>-0.023</u>	1.000

Table 5: Trader CEO and Corporate Investments

The table reports the results of the following time-series regression.

$$CI_{it} = \alpha + \beta_1 T_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it},$$

where CI_{it} is corporate investments variable that is undertaken by firm i in year t and T_{it} represents a dummy variable that takes the value of 1 if the CEO of firm i is an active trader or 0 if she is not. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term. The corporate investment variable is the magnitude of investments on R&D, capital expenditure and business acquisitions, and total investments (as the sum of magnitudes of investments on R&D, capital expenditure and business acquisitions). All of these variables are scaled by total assets of firm i for year t. CEO and firm control variables are defined in Table 1. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market. Standard errors clustered at the firm level are shown in parentheses. ***, ** and * denote statistical significance at a 1%, 5% and 10% level, respectively.

Dependent Variable	Research and Development	Capital Expenditure	Business Acquisition	Total Investment
Intercept	0.4625**	0.0692*	0.0076	0.5307***
	(0.1996)	(0.0414)	(0.0215)	(0.1991)
Trader CEO	0.0004	0.0173*	0.0107**	0.0235
	(0.0175)	(0.0102)	(0.0049)	(0.0196)
CEO Controls				
Salary/REV	0.2133***	-0.0068*	0.1751***	0.3806***
	(0.0183)	(0.0058)	(0.0056)	(0.0197)
Common Share Ownership (%)	-0.0008	-0.0014*	-0.0014***	-0.0035
	(0.0028)	(0.0008)	(0.0043)	(0.0028)
Option Share Ownership (%)	0.4705	-0.7700	-0.2402	-0.5425
	(1.5747)	(0.4720)	(0.0056)	(1.9415)
Age	-0.0002	0.0009	-0.0009***	-0.0005
	(0.0008)	(0.0007)	(0.0003)	(0.0010)
Firm Controls				
Log Total Assets	-0.0202**	-0.0026	0.0027**	-0.0200**
	(0.0094)	(0.0021)	(0.0010)	(0.0091)
Tobin's Q	-0.0018	0.0008	0.0007	-0.0007
	(0.0080)	(0.0017)	(0.0007)	(0.0077)
Leverage	-0.0093**	-0.0033	0.0014**	-0.0111**
	(0.0054)	(0.0031)	(0.0023)	(0.0067)
Fixed Industry Effects	Yes	Yes	Yes	Yes
Fixed Year Effects	Yes	Yes	Yes	Yes
Firm Clustered Std Errors	Yes	Yes	Yes	Yes
Number of Observations	723	723	723	723
Number of firms	107	107	107	107
Adjusted R-Square	0.2125	0.0963	0.2918	0.2554

Table 6: Trader CEO and the Likelihood of Total Corporate Investments

This table shows the relation between the likelihood of total investment (measured as total investment scaled by total assets) and the trader CEO dummy variable. Logistic regressions are used based on three tranches of total investment. The first, the second and the third tranches include the firms for which the total investment is less than 5%, between 5-15%, and greater than 15% of total assets, respectively. We estimate following logistic regression three times for each tranche.

$$Pr(Z_{it}) = \frac{1}{1 + e^{-(\beta_1 T_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it})}}$$

where T_{it} represents an indicator variable that takes the value of 1 if the CEO of firm i is a trader in year t or 0 if she is not. Z_{it} is the dependent variable that takes the value 1 for the tranche of total investment that we are investigating and 0 otherwise. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term. In all three regressions, we account for fixed industry and year effects and the significance of the estimated odds ratio coefficients are assessed with a Wald test. The variables are defined in Table 1. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market. ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

	Total Investments < 5% Average Total Investment=3.11%		5%< Total Investments < 15% Average Total Investment=8.82%		Total Investments > 15% Average Total Investment=30%	
	Odds Ratio	Wald	Odds Ratio	Wald	Odds Ratio	Wald
Intercept	-	0.1083	-	2.7799*	-	1.6605
Trader CEO	0.4840	12.3169***	1.1760	1.0176	1.4230	3.7350*
CEO Controls						
Salary/Rev	0.0010	4.0018**	0.0010	5.6266**	>15.999	9.9078***
Common Share Ownership (%)	0.8890	0.2175	1.0220	0.0306	1.0430	0.1292
Option Share Ownership (%)	14.6350	0.0184	0.0090	0.0576	6.9690	0.0124
Age	1.0290	3.0025**	0.9800	2.1993	1.0030	0.0364
Firm Controls						
Log Total Assets	0.8930	3.0417**	1.1650	8.6078***	0.8660	5.8269**
Tobin's Q	0.8140	8.6220***	0.9970	0.0355	1.0810	2.4678
Leverage	1.5270	16.1414***	0.8630	2.2509	0.6890	6.0375**
Fixed Industry Effects	Yes		Yes		Yes	
Fixed Year Effects	Yes		Yes		Yes	
Number of Observations	723		723		723	
Number of firms	107		107		107	
C Statistic	0.736		0.671		0.748	

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Table 7: CEO Portfolio Turnover and Corporate Investments

The table reports the results of the following time-series regression.

$$CI_{it} = \alpha + \theta_1 F_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it},$$

where CI_{it} is corporate investment variable that is undertaken by firm i in year t, and F_{it} is the portfolio turnover variable for CEO of firm i in year t. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term. The corporate investment variable is the magnitude of investments on R&D, capital expenditure and business acquisitions, and total investments (as the sum of magnitudes of investments on R&D, capital expenditure and business acquisitions). All of these variables are scaled by total assets of firm i for year t. CEO and firm control variables are defined in Table 1. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market. Standard errors clustered at the firm level are shown in parentheses. ***, ** and * denote statistical significance at a 1%, 5% and 10% level, respectively.

Dependent Variable	Research and Development	Capital Expenditure	Business Acquisition	Total Investments
Intercept	0.4185***	0.0825**	0.0092	0.5076***
	(0.1585)	(0.0397)	(0.0212)	(0.1573)
CEO Portfolio Turnover	0.0312	0.0007	0.0052*	0.0304
	(0.0284)	(0.0033)	(0.0038)	(0.0314)
CEO Controls				
Salary/REV	0.2148***	-0.0078	0.1748***	0.3807***
	(0.0195)	(0.0060)	(0.0060)	(0.0208)
Common Share Ownership (%)	-0.0003	-0.0017**	-0.0015***	-0.0034
	(0.0025)	(0.0008)	(0.0005)	(0.0027)
Option Share Ownership (%)	0.5061	-0.7241	-0.2062	-0.4453
	(1.4699)	(0.5413)	(0.3613)	(1.9787)
Age	0.0000	0.0009	-0.0009***	0.0002
	(0.0009)	(0.0007)	(0.0003)	(0.0011)
Firm Controls				
Log Total Assets	-0.0188**	-0.0029	0.0028***	-0.0190**
	(0.0078)	(0.0020)	(0.0011)	(0.0076)
Tobin's Q	-0.0020	0.0006	0.0000	-0.0012
	(0.0081)	(0.0016)	(0.0008)	(0.0079)
Leverage	-0.0106**	-0.0033	0.0011***	-0.0124**
	(0.0049)	(0.0030)	(0.0021)	(0.0058)
Fixed Industry Effects	Yes	Yes	Yes	Yes
Fixed Year Effects	Yes	Yes	Yes	Yes
Firm Clustered Std Errors	Yes	Yes	Yes	Yes
Number of Observations	723	723	723	723
Number of firms	107	107	107	107
Adjusted R-Square	0.2400	0.0857	0.2898	0.2698

Table 8: Trader CEO and Corporate Investments-Estimation of Average Treatment Effect Based on PSM

This table presents treatment adjusted relationship between trader CEOs and level of corporate investments. Four PSM techniques are used- nearest neighborhood matching, kernel matching (Gaussian kernel), Stratification and the radius method. The range for the radius method is 0.1. The table shows the average treatment effect on the treated (ATET) for the corporate investments by companies that have trader CEOs versus those which are not managed by trader CEOs. Matching variables are Salary/REV, Common Share Ownership (%), Option Share Ownership (%), Log Total Assets, Tobin's Q, Leverage, and industry and year dummies. The corporate investments variables used in the PSM analysis are the magnitude of investments on R&D, capital expenditure and business acquisitions, and total investments (as the sum of magnitudes of investments on R&D, capital expenditure and business acquisitions). All of these variables are scaled by total assets of the firm. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market. Matching is conducted with replacement and bootstrapped standard errors are shown in parentheses. ***, ** and * denote statistical significance at a 1%, 5% and 10% level, respectively. The bootstrapped standard errors are based on 100 replications. All variables are defined in Table 1.

PSM method	Nearest neighbor	Kernel	Stratification	Radius
Research and Development	0.0081	0.016	0.0119	0.0133
	(0.0123)	(0.0114)	(0.0113)	(0.0109)
Capital Expenditure	0.0201**	0.0182***	0.0189***	0.0184***
	(0.0089)	(0.0057)	(0.0065)	(0.0065)
Business Acquisition	0.0108*	0.0111**	0.0085*	0.0084**
	(0.006)	(0.0048)	(0.0046)	(0.0041)
Total Investment	0.0357*	0.0419***	0.0359***	0.0368***
	(0.0183)	(0.0128)	(0.0127)	(0.0128)

Table 9: Trader CEO, CEO Education and Corporate Investments

The table reports the results of the following time-series regression.

$$CI_{it} = \alpha + \beta_1 T_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it},$$

where CI_{it} is corporate investments variable that is undertaken by firm i in year t and T_{it} represents a dummy variable that takes the value of 1 if the CEO of firm i is an active trader or 0 if she is not. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term. The corporate investment variable is the magnitude of investments on R&D, capital expenditure and business acquisitions, and total investments (as the sum of magnitudes of investments on R&D, capital expenditure and business acquisitions). All of these variables are scaled by total assets of firm i for year t. CEO and firm control variables are defined in Table 1. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market. Standard errors clustered at the firm level are shown in parentheses. ***, ** and * denote statistical significance at a 1%, 5% and 10% level, respectively.

Dependent Variable	R&D	Capital Expenditure	Business Acquisition	Total Investments
Intercept	0.4194**	0.0905*	0.012	0.5080*
	(0.1883)	(0.0464)	(0.0259)	(0.1860)
Trader CEO	0.0021	0.0187*	0.0104**	0.0270
	(0.0178)	(0.0106)	(0.0050)	(0.0194)
CEO Controls				
Salary/Rev	0.2054***	-0.0116*	0.1749***	0.3686***
	(0.0173)	(0.0062)	(0.0051)	(0.0184)
Common Share Ownership (%)	-0.0011	-0.0011	-0.0012***	-0.0034
	(0.0022)	(0.0001)	(0.0004)	(0.0021)
Option Share Ownership (%)	-0.0423	-0.8373	-0.4246	-1.34
	(1.3067)	(0.5076)	(0.3125)	(1.596)
Age	-0.0002	0.0009	-0.001***	-0.0001
	(0.0008)	(0.0007)	(0.0003)	(0.001)
Education Controls				
Finance	-0.0169	-0.0169	-0.0189	-0.0525*
	(0.02815)	(0.0212)	(0.0116)	(0.0307)
Technical	0.0100	-0.0117	-0.0216*	-0.0234
	(0.0288)	(0.0229)	(0.0117)	(0.0323)
MBA	0.1069*	0.0196	0.0293	0.159**
	(0.0577)	(0.0269)	(0.0183)	(0.0623)
Advanced Degree	0.0605**	-0.0055	0.0264	0.0884***
	(0.0282)	(0.0235)	(0.0164)	(0.0327)
Firm Controls				
Log Total Assets	-0.0213*	-0.0027	0.0025*	-0.0215**
	(0.0096)	(0.0021)	(0.0010)	(0.0093)
Tobin's Q	-0.0017	0.0010	-0.0002	-0.0007
	(0.0078)	(0.0017)	(0.0007)	(0.0075)
Leverage	-0.0109*	-0.0032	0.0017	-0.0123*
	(0.0059)	(0.0032)	(0.0022)	(0.0069)
Fixed Year and Industry Effects	Yes	Yes	Yes	Yes
Firm Clustered Std Errors	Yes	Yes	Yes	Yes
Number of Observations	723	723	723	723
Adjusted R-Square	0.2294	0.1091	0.2993	0.2763

Table 10: CEO Portfolio Turnover, CEO Education and Corporate Investments

The table reports the results of the following time-series regression.

$$CI_{it} = \alpha + \theta_1 F_{it} + \gamma_1 X'_{it} + \delta_1 Y'_{it} + \epsilon_{it},$$

where CI_{it} is corporate investments variable that is undertaken by firm i in year t, and F_{it} is the portfolio turnover variable for CEO of firm i in year t. X'_{it} and Y'_{it} are CEO and firm control variables, for firm i at year t, and ϵ_{it} is an error term. The corporate investment variable is the magnitude of investments on R&D, capital expenditure and business acquisitions, and total investments (as the sum of magnitudes of investments on R&D, capital expenditure and business acquisitions). All of these variables are scaled by total assets of firm i for year t. CEO and firm control variables are defined in Table 1. The sample includes 723 firm-year observations for the period of 2005-2011 in Finnish market. Standard errors clustered at the firm level are shown in parentheses. ***, ** and * denote statistical significance at a 1%, 5% and 10% level, respectively.

Dependent Variable	Research and Development	Capital Expenditure	Business Acquisition	Total Investments
Intercept	0.3759***	0.1036***	0.01225	0.4845***
	(0.0666)	(0.0378)	(0.0265)	(0.0785)
CEO Portfolio Turnover	0.00001	0.0310***	0.0048**	0.0291***
	(0.0035)	(0.0061)	(0.0024)	(0.0072)
CEO Controls				
Salary/Rev	0.2077***	-0.0123	0.1749***	0.3698***
	(0.0290)	(0.0164)	(0.0116)	(0.0342)
Common Share Ownership (%)	-0.0008	-0.0014	-0.0013	-0.0035
	(0.0057)	(0.0032)	(0.0022)	(0.0067)
Option Share Ownership (%)	-0.0073	-0.7718	-0.3839	-1.2197
	(1.12266)	(0.6370)	(0.4480)	(1.3233)
Age	0.0001	0.00082*	-0.0009***	0.00007
	(0.0008)	(0.0004)	(0.0003)	(0.0009)
Education Controls				
Finance	-0.01438	-0.01552	-0.0177**	-0.0482*
	(0.0216)	(0.0122)	(0.0086)	(0.0254)
Technical	0.0147	-0.01261	-0.0213**	-0.0201
	(0.0210)	(0.0119)	(0.0084)	(0.0248)
MBA	0.0999***	0.01941	0.0280*	0.1521***
	(0.0362)	(0.0205)	(0.0144)	(0.0427)
Advanced Degree	0.0581*	-0.0035	0.0271**	0.0887**
	(0.0328)	(0.0186)	(0.0130)	(0.0386)
Firm Controls				
Log Total Assets	-0.0198***	-0.003*	0.0025**	-0.0205***
	(0.0028)	(0.0016)	(0.0011)	(0.0033)
Tobin's Q	-0.0018	0.0006	-0.0001	-0.0012
	(0.0024)	(0.0014)	(0.0009)	(0.0029)
Leverage	-0.0124**	-0.0030	0.0015	-0.0136*
	(0.006)	(0.0034)	(0.0024)	(0.007)
Fixed Year and Industry Effects	Yes	Yes	Yes	Yes
Firm Clustered Std Errors	Yes	Yes	Yes	Yes
Number of Observations	723	723	723	723
Adjusted R-Square	0.2329	0.0683	0.275	0.2656