THE FINAL COUNTDOWN: THE CEO HORIZON PROBLEM IN SWEDEN

AN INVESTIGATION OF PRE-RETIREMENT OPPORTUNISM AMONG CEOS IN SWEDISH LISTED FIRMS

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Master Thesis

Stockholm School of Economics

2020

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Abstract:

We examine the effects of CEO retirement on net capital expenditures in Swedish listed firms. Specifically, we investigate whether retiring CEOs in Swedish listed firms act opportunistically prior to retirement, commonly defined as the CEO horizon problem. The CEO horizon problem assumes that a retiring CEO opportunistically maximises short-term personal gains at the cost of the firm's long-term commitment. A sample of 3,538 observations of firms listed on the Stockholm Stock Exchange between 2001-2017 is analysed using several multivariate regression models to detect opportunistic decreases in net capital expenditures before CEO retirement. Our results suggest that CEOs in Swedish listed firms decrease net capital expenditures prior to retirement, indicating that the CEO horizon problem is prevalent in Sweden. Moreover, we find two mitigating factors to the pre-retirement opportunistic behaviour, higher ownership concentration and social identification to a Swedish business sphere. Our study contributes to the literature in three ways. First, our findings imply that pre-retirement opportunism and the CEO horizon problem can exist in what has been argued to be a seemingly low-opportunistic context. Second, we broaden the understanding of the effects of corporate governance mechanisms by showing that higher ownership concentration mitigates the CEO horizon problem. Third, the study highlights the importance of understanding how certain social characteristics of a retiring CEO might impact the CEO horizon problem.

Keywords:

CEO Horizon Problem, CEO Retirement, Ownership Concentration, Social Identification, Business Sphere

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Acknowledgements

We would like to express our sincerest gratitude to our supervisor Stina Skogsvik, Assistant Professor at the Department of Accounting at the Stockholm School of Economics, for her excellent guidance. She has always made herself been available to us, provided valuable advice and supported us throughout the process. Further, we would also like to express our appreciation to Antonio Vazquez, Assistant Professor at the Department of Accounting at the Stockholm School of Economics, for his invaluable advice.

Stockholm, May 2020

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1. Introduction

When people approach retirement, they may no longer be as bothered by the long-term performance of their organisation. For firms with retiring CEOs, this lack of concern can be detrimental as CEOs tend to have large discretion over firm actions (Hambrick & Finkelstein, 1987). Neglecting firm actions that lead to long-term performance can have a significant impact on the value of the firm (Xu & Yan, 2014) and must therefore be understood by firm owners and boards. The "no-tomorrow" mindset and the subsequent opportunistic behaviour of retiring CEOs is defined as the CEO horizon problem (Dechow & Sloan, 1991; Conyon & Florou, 2006). The retiring CEO does not need to consider the next position in the career and can instead focus on maximising short-term personal gains over long-term commitments (Fama, 1980). To understand CEO pre-retirement behaviour, researchers have developed theoretical predictions based on the agency and the prospect theory (Dechow & Sloan, 1991; Matta & Beamish, 2008). The empiric research on the CEO horizon problem studies if and how retiring CEOs engage in opportunistic behaviour prior to retirement through for example decreasing R&D investments (Dechow & Sloan, 1991), fewer international acquisitions (Matta & Beamish, 2008) and curbing capital expenditures (Silberzahn & Arregle, 2019). The most recent literature in the research field focuses on how retiring CEOs' opportunistic behaviour is impacted by the interplay between corporate governance, long-term equity-based incentives and CEO characteristics (Abernethy, Jiang & Kuang, 2019; Silberzahn & Arregle, 2019).

However, extant empirical literature exhibit contradicting results. Several studies set out to study the horizon problem and find no or only partial evidence thereof (e.g. Murphy & Zimmerman, 1993; Cazier, 2011). Also, to the best of our knowledge, merely two articles exist examining the CEO horizon problem outside of the US, again with inconsistent results (Conyon & Florou, 2006; Fang, He & Conyon; 2018). As the CEO horizon problem draws on the properties of the agency theory, a theory developed in a US context (Lubatkin, Lane, Collin & Very, 2005), the research field could benefit from a geographical extension. Additional studies in other national contexts is also called for in previous research (Fang et al., 2018; Silberzahn & Arregle, 2019).

Furthermore, the opportunistic behaviour of retiring CEOs is argued to be mitigated by corporate governance controls in form of better contractual incentives and monitoring (Dechow & Sloan, 1991; Gibbons & Murphy, 1992). On the other hand, which corporate governance controls that are the most important is still under investigation by scholars within the research field (e.g. Oh, Chang & Cheng, 2016; Xu & Yan, 2014). For example, a corporate governance mechanism relevant regardless of national context is the level of ownership concentration and its effect on controlling managers (Shleifer & Vishny, 1997). However, the impact of ownership concentration on retiring CEOs' opportunistic behaviour remains untested.

Beyond the research on the mitigating effects from corporate governance controls, recent articles have focused on broadening the understanding of what types of CEO characteristics and social identities that have a mitigating effect on pre-retirement opportunistic behaviour (Abernethy et al., 2019; Silberzahn & Arregle, 2019). Lastly, the theoretical predictions of the

two main theories in the research field, the agency and the prospect theory, are contradicting in some regards. For example, the impact of equity-based incentives on the behaviour of retiring CEOs divides the research field (Dechow & Sloan, 1991; Matta & Beamish, 2008; Abernethy et al., 2019; Silberzahn & Arregle, 2019). These inconsistencies in the empirical and theoretical research on the CEO horizon problem call for additional studies on the subject, preferably outside of the US. Therefore, we seek to answer the following questions:

1. *Is the CEO horizon problem prevalent in Swedish listed firms?*

2. *Given a prevalence of the CEO horizon problem, is there a mitigating effect of ownership concentration on the CEO horizon problem?*

3. *Given a prevalence of the CEO horizon problem, are there characteristics and social identities particular to CEOs in Swedish listed firms that can mitigate the CEO horizon problem?*

We aim to operationalise these research questions through conducting a quantitative analysis on the effect of CEO retirement on net capital expenditures. Using panel data of Swedish listed firms between the years 2001-2017, we conduct a correlational longitudinal study analysing the CEO horizon problem in Sweden. Moreover, we extend our multivariate models to include the effects of ownership concentration and CEO social identification. We also perform a battery of robustness tests to verify our results. Our results suggest that the CEO horizon problem is prevalent in Sweden. Furthermore, we find that pre-retirement opportunistic behaviour is mitigated by a higher ownership concentration and by CEOs' potential social identification to business spheres.

Our study makes four main contributions to extant literature. Firstly, we provide additional findings to the inconsistent results in the research field on the CEO horizon problem, through evidencing that the CEO horizon problem exists in a Swedish setting. Correspondingly, our findings imply that pre-retirement opportunism can exist in what has been argued to be a seemingly low-opportunistic context. Secondly, we add to the literature on corporate governance and the CEO horizon problem, showing how a higher level of ownership concentration can mitigate pre-retirement opportunistic behaviour. Thirdly, we further the research on CEOs' social identification by showing the existence and effect of social identification to business spheres in mitigating the opportunistic behaviour of retiring CEOs. For practitioners, these contributions can provide insight into how to manage the behaviour of retiring CEOs. Lastly, we make a contribution to future research in Sweden by hand-collecting data of CEO compensation from about 4,500 individual annual reports in listed Swedish firms in the years 2001-2017, previously unavailable in a single dataset.

The remainder of the paper is structured as follows. The next two sections delineate the theoretical background and previous empirical literature respectively. The subsequent section provides a background to the Swedish context. Next, we present our hypotheses. Thereafter, we introduce the methodology applied and the motivations for the variables included in our analysis. In section seven, we present the results of our study. Subsequently, we discuss our findings. Finally, we present our conclusions, limitations and our proposals for future research.

2. Theoretical Development of the CEO Horizon Problem

Two principal theories constitute the foundation for explaining and predicting CEO behaviour before, during and after retirement. In the following section, we aim to present, compare and problematise these theories and their predictions regarding the CEO horizon problem. Furthermore, we argue that an additional theory, the social identity theory, could contextualise and complement the two former theories. A summary of the theories and their predictions regarding the CEO horizon problem can be found in Appendix, Table 1. Furthermore, a figure of the interplay between CEO behaviour during different phases of retirement and theoretical predictions can be found in Appendix, Figure 1.

2.1 The Agency Theory

Jensen and Meckling's paper from 1976 examines the problem that arises when separating ownership and control between a firm owner (principal) and a manager (agent). While this problem had already been widely recognised (e.g. Berle & Means, 1932), Jensen and Meckling (1976) present a theory that establishes the relationship between the 'ownership and control issue' and costs for owners, defined as agency costs. Given that the CEO is utility maximising and opportunistic, his or her actions will not always benefit the firm owner (Jensen & Meckling, 1976). As a response, the owner wants to limit the divergence of the CEO's actions from an owner-optimal viewpoint (ibid.). The measures to decrease such divergent actions are to incur monitoring costs by the principal (e.g. incentives) or bonding costs by the agent (e.g. financial reporting). These actions decrease agency problems, but cannot shrink them to zero, generating a residual loss. The residual loss exists as shareholders cannot fully control all actions of the CEO. An example of such a residual loss could be uses of corporate resources for personal gains and extraordinary bonuses to the CEO that shareholders cannot control, which is a direct cost to shareholders. The total agency costs are therefore the cost of monitoring, bonding activities and a residual loss. The size of the agency costs is dependent on both internal factors such as CEO characteristics and the governance structures of the firm (e.g. contractual and monitoring controls) and on external factors such as the market for capital and managers (Jensen & Meckling, 1976). The external factors have been more carefully examined in a study by Fama in 1980. In his study, Fama (1980) states that market controls and the existence of a competitive managerial job market has important monitoring and disciplining effects on managers, pressuring CEOs to act in the best interest of shareholders to be able to improve career prospects (Fama, 1980; Gibbons & Murphy, 1992). In turn, these pressures decrease agency costs (ibid.).

2.1.1 Agency Theory and the CEO Horizon Problem

As the separation of ownership and control is a multiperiod problem, some specific effects related to the time horizons of CEOs emerge. Jensen and Meckling (1976) argue that over time, information asymmetry between CEOs and owners decreases, effectively reducing agency costs. However, when a CEO has a finite horizon, some of the current decisions with long-term implications will not directly affect the CEO, but the successor, which invites the current CEO

to engage in a more opportunistic behaviour (Jensen & Meckling, 1976; Smith & Watts, 1982). This would be the case of a retiring CEO, as he or she does not need to consider the next position in the career. Therefore, the monitoring effects of the manager job market and competition from other managers are less prevalent (Fama, 1980; Smith & Watts, 1982). As retiring CEOs face fewer career concerns and are less bothered by market monitoring, the agency theory predicts that retiring CEOs will act opportunistically, inducing agency costs and decreasing firm value (Smith & Watts, 1982; Dechow & Sloan, 1991). This is defined as the CEO horizon problem (ibid.).

Additionally, the agency theory predicts that contractual controls based on short-term earnings performance (such as bonuses based on revenue, operational results or cash flow measurement) can encourage the myopic behaviour of retiring CEOs (Dechow & Sloan, 1991). As retiring CEOs will not reap the long-term benefits of firm decisions, they are expected to seek to maximise short-term earnings-based compensations at the cost of potential long-term gains (ibid.). An example of this behaviour is the decision to reduce firm investments, whose benefits are long-term and uncertain, to increase the current short-term result and thus the CEO earnings-based bonus (ibid.).

With less market control mechanisms and the encouragement of opportunism through earnings-based incentives, other types of contractual controls such as long-term equity-based compensation, become important in aligning retiring CEOs' risk preferences to those of shareholders' (Smith & Watts, 1982; Gibbons & Murphy, 1992). However, monetary incentives might not be enough to eliminate pre-retirement managerial short-termism. Instead, an 'optimal contract' must be combined with additional corporate governance tools (Marinovic & Varas, 2019).

While the agency theory establishes theoretical predictions for retiring CEOs from an owner-perspective, it does not offer explanations as to why the behaviour of retiring CEOs vary despite similar governance controls.

2.2 The Prospect Theory

The prospect theory is developed by Kahneman and Tversky in 1979 as a critique of the expected utility theory, redefining the literature on decision making preference under risk. The theory argues that individuals underweight uncertain outcomes to those that are achieved with confidence, creating risk aversion in guaranteed gains and risk seeking in sure losses (Kahneman & Tversky, 1979). This finding implies that an individual can express a preferred choice when evaluating two prospects with different probabilities but with identical expected values. Also, according to Kahneman and Tversky (1979), the higher the level of the original gain, the less does an individual attach value to additional increases and the more risk averse it becomes. Additionally, the value curve for losses is steeper than the gain curve, demonstrating that a loss is more painful than the pleasure of a gain of the same amount (Kahneman & Tversky, 1979). This notion is called loss aversion and is further described by Wiseman and Gomez-Mejia in 1998. As outlined by the authors, the assumption of loss aversion contradicts the view of the 'agent self-interest' based on agency theories, which stipulates the agent as

wealth maximising (Wiseman & Gomez-Mejia, 1998). Instead of maximising future wealth, agents are believed to minimise losses to existing wealth (ibid.).

2.2.1 Agency Theory, Prospect Theory and the CEO Horizon Problem

The agency theory, based on economic research, seems to be able to predict several aspects of the CEO horizon problem. However, as noted by Wiseman and Gomez-Meija (1998), agency theory is limited by the premise of its invariable risk-aversion and uncertain predictions of how managerial behaviour is affected by corporate governance. Instead, Wiseman and Gomez-Meija (1998) argue that *"(...) the prospect and agency theories are complementary so that combining them may improve the predictive and explanatory value of agency-based models of executive risk-taking behavior*". Therefore, by combining the agency theory with the behavioural economics-based prospect theory, an even more detailed understanding of the CEO horizon problem is discernible. To concretise, while according to the agency theory, contractual controls such as firm specific equity and option holdings of retiring CEOs would decrease opportunistic behaviour, it is predicted to induce a wealth preserving behaviour for retiring CEOs according to the prospect theory (Matta & Beamish, 2008). As the wealth from equity and options are already accounted for in the wealth perception of the CEO, he or she becomes loss averse when approaching retirement (ibid.). This loss aversion translates to an increased risk aversion for firm decisions with uncertain long-term outcomes (Wiseman & Gomez-Meija, 1998). In other words, the incentives that were created to align the CEOs' risk preferences to those of the shareholders according to the agency theory, actually incentivise retiring CEOs to become risk averse in decision making by preventing losses, rather than aiming for gains, according to the prospect theory. Furthermore, Matta and Beamish (2008) use the prospect theory to explain the effects of legacy conservation in the CEO horizon problem. The authors claim that in fear of destroying their legacy, CEOs' risk aversion increases near retirement, resulting in decreased investments in risky projects. This behaviour is related to the loss aversion as described by Kahneman and Tversky (1979). As CEOs have built up a legacy during their entire career, the perceived value of that legacy is large, why CEOs would become eager to conserve this level and thus becoming more risk averse in their actions and decisions.

The common denominator in the prospect theory-based behaviour of wealth preservation and legacy conservation is the prediction that a retiring CEO fears to lose what has been built during the entire career. This increased loss aversion will then be reflected in the retiring CEO's actions and decisions in the firm, such as decreasing risky investments. Matta and Beamish (2008) defines this prediction as the 'accentuated CEO career horizon problem'.

2.3 The Social Identity Theory

While both the agency theory and the prospect theory lay a foundation for the predictions of the behaviour of retiring CEOs, we believe that there are complementary theories that could deepen the understanding of retiring CEOs' behaviour. Research in the field of the CEO horizon problem has examined the characteristics of CEOs and most recently focused on their identity (Abernethy et al., 2019; Silberzahn & Arregle, 2019). For example, Silberzahn and

Arregle (2019), argue that the social identity theory can shed light on variations in retiring CEOs' behaviour and organisational outcomes. Similarly, we argue that the predictability of the agency and the prospect theory can be complemented by paying attention to the characteristics and identities of retiring CEOs.

The concept of social identity as a theory was established by Tajfel in 1982, based on psychology research. The theory examines how individuals characterise and define themselves in terms of the social category to which they perceive to belong to (Ashforth & Mael, 1989; Mael & Ashforth, 1992). Moreover, the social identification can influence the actions and behaviour of an individual, and the individual will try to act in the best interest of the perceived social category (Tajfel, 1982, Ashforth & Mael, 1989). The social categories and identities can be multiple, for example gender, nationality and political affiliation (Hogg, 1993; Miller & Le Breton-Miller, 2011).

One important social category for senior executives are the firms at which they work (Cannella, Jones & Withers, 2015). Even within the firm, a senior executive can establish multiple social ties to different stakeholders (ibid.). In a study on social identity theory by Hillman, Nicholson and Shropshire (2008), the authors develop five contextually relevant identities for directors; the organisation, customers and/or suppliers, being a director, being a CEO and shareholders. While not explicitly focusing on CEOs, but on directors, Hillman et al. (2008) argue that the agency theory predictions can, or even needs to, be combined with the understanding of a director's identification. Hillman et al. (2008) explicitly refer to the agency theory and show how intrinsic motivation from social identification can affect the actions of the directors and how this in turn has implications for corporate governance in firms.

Relating these insights back to the CEO horizon problem, the social identity theory predicts that the degree and type of opportunism that a retiring CEO would engage in depends on the CEO's specific social identity and the strength of this identification.

2.4 Problematising and Comparing the Theories

Firstly, an inconsistency of the theoretical predictions of the CEO horizon problem that we wish to problematise is the combination of the prospect theory and the agency theory, and its joint explanation of a retiring CEO's behaviour. The agency theory predicts that, due to lack of market controls (i.e. career concerns), retiring CEOs will act opportunistically. It does not state *how* the retiring CEO will act opportunistically, other than maximising short-term benefits. What kind of activities a retiring CEO engage in to maximise short-term benefits depend on other governance mechanisms, such as the incentives from contractual controls. As exemplified in the agency theory-based article by Dechow and Sloan (1991), the authors find that earnings-based bonuses lead retiring CEOs to decrease discretionary R&D which, being a precarious investment, also decreases the risk of the firm. In other cases, we could hypothetically see a retiring CEO engage in *more* discretionary spending and therefore *increase* the risk of the firm, if it generates maximised short-term benefits. This scenario would still entail a CEO horizon problem and related agency costs. However, both opportunistic scenarios of a retiring CEO according to the agency theory, either decreasing or increasing firm risk, are

not compatible with the properties of the prospect theory. The prospect theory predicts CEOs to become loss averse and risk minimising prior to retirement, why an accentuated decrease in firm risk only exist in the first scenario of the combination of the two theories. Therefore, the prospect theory's suggestion that retiring CEOs will become more risk-averse is only an 'accentuated CEO career horizon problem' when combined with governance mechanisms leading to risk-decreasing actions of the retiring CEO per the agency theory.

Secondly, the two streams of CEO horizon problem literature, one based solely on the agency theory and one on the combination of the agency theory and the prospect theory, induce certain puzzles for the research field. One of the inconsistencies originating from the literature is how CEO equity and option holdings influence the opportunistic behaviour of the retiring CEO. While according to the agency theory, equity-based incentives are predicted to mitigate short-termism prior to retirement, the prospect theory predicts an increased short-termism from equity and option holdings. Furthermore, while the agency theory based literature suggest several theoretical mitigating factors to the CEO horizon problem, generally different control mechanisms such as equity incentives or CEO relay processes[1], the prospect theory combined with the agency theory suggests no concrete way to mitigate the risk-aversive behaviour of retiring CEOs with equity and option holdings.

Thirdly, the notion that legacy conservation induces risk averse behaviour per the prospect theory has been questioned. Conflicting to the idea of legacy conservation, some authors argue that retirement allows CEOs to contemplate on what they have yet not achieved, giving CEOs a last chance to accomplish their goals in the pre-retirement years (Sonnenfeld, 1988). To achieve their goals, CEOs may want to engage in risky projects with a significant impact, such as a major investment, in order to leave a distinct legacy behind (Conyon & Florou, 2006; Silberzahn & Arregle, 2019) or maintain commitment to long-term engagements to preserve a legacy (Kang, 2016). Moreover, in direct contrast to an idea of legacy conservation, Alfonso, Brooks, Simonov and Zhang (2019) argue in their study that the reason for why late career-stage CEOs act opportunistically is the decreasing need for preserving reputation capital. Therefore, the emphasis put on the prospect theory based legacy conservation argument and its predictions for risk-decreasing pre-retirement behaviour should be made with caution.

Lastly, while the agency theory predicts and explains several aspects of principal-agent relations, it has been argued that the agency theory does not fit all social and national contexts and therefore lacks generalisability. Specifically, some hold that agency theory lacks the understanding that opportunism between agents and principals can vary depending on the social and national context (Davis, Schoorman & Danielson, 1997; Lubatkin, Lane, Collin & Very, 2007). These authors argue that there exist cases and types of principal-agent relations where agents may not act opportunistically, suggesting that there may exist contexts where there is no general motivational issue for CEOs to act in the best interest of owners (Donaldson & Davis, 1991; Davis et al., 1997). Given that the agency theory-based predictions of the CEO horizon problem are based on the presumption that retiring CEOs act opportunistically, a

[1] Vancil (1987) defines a 'relay process' as a process where the successor is selected internally several years before the announced retirement. Furthermore, the old CEO stays as Chairman of the Board.

tension in the view of opportunism and its interplay with the CEO horizon problem seems to emerge. However, the argument that opportunism that varies with contexts is incompatible with agency theory has been questioned. Gomez-Meija and Wiseman argue in their 2007 article that agency theory does not lack generalisability but instead, through its simplicity, can be applied to a wide variety of contexts and that agency problems exists even in contexts with more or less opportunism. Therefore, one can hold that agency problems exist as long as there are principal-agent relations, regardless of contexts and different behavioural propensities of opportunistic behaviour (Gomez-Meija & Wiseman, 2007).

3. Literature Review

3.1 The CEO Horizon Problem and the Agency Theory

3.1.1 Previous Research on the CEO Horizon Problem Based on Agency Theory

Smith and Watts (1982) are the first researchers explicitly mentioning the concept of a CEO horizon problem. Since then, the empirical literature has, motivated by the theoretical predictions by the agency theory, researched several ways that retiring CEOs can act opportunistically, outlined by several broad categories; real earnings management (e.g. Butler & Newman, 1989; Dechow & Sloan, 1991; Abernethy et al., 2019), accruals earnings management (Davidson, Xie, Xu & Ning, 2007; Kalyta, 2009) and 'conditional accounting conservatism' (Chen, Ni, & Zhang, 2018). Real earnings management relates to any actions leading to abnormal cash flows, such as acceleration of the timing of sales through price-adjustments or a decrease in discretionary spending (Roychowdhury, 2006). Accruals earnings management relate to the adjustment of accruals to modify and attain a certain reported result (Healy & Wahlen, 1999). Lastly, conditional accounting conservatism relates to the discretionary application of valuation principles to manage earnings either conservatively (downwards) or less conservatively (upwards) (Beaver & Ryan, 2005; Chen et al., 2018). The following passage will address CEO horizon problem articles focused on real earnings management. To see a full tabulation of agency-based empirical articles on the CEO horizon problem, see Table 2 in Appendix.

Building upon the theoretically developed findings of a CEO horizon problem by Smith and Watts (1982), two early articles based on the agency theory, Butler and Newman (1989) and Dechow and Sloan (1991), display empirically inconsistent results. Both studies investigate how earnings-based compensation incentivises short-termism and real earnings management close to retirement. Butler and Newman (1989) examine a US sample of retiring CEOs and the alterations of R&D, capital expenditures and production levels as a way to boost short-term earnings, although find no significant effects. In contrast, Dechow and Sloan (1991) find the first empirical evidence of short-term and opportunistic pre-retirement behaviour among CEOs when studying the CEO horizon problem in R&D intensive industries. Through a study of US CEO turnover events, the article concludes that during a CEO's pre-retirement years, discretionary spending decreases as the CEO seeks to maximise short term bonuses at the cost of potential long-term gains (Dechow & Sloan, 1991). Furthermore, Dechow and Sloan (1991) find two mitigating factors to the decreases in R&D spending; CEO equity-based holdings and CEO retirements conducted through a relay process. A few years later, Murphy and Zimmerman (1993) criticise previous research, including Dechow and Sloan (1991), for being too focused on a single variable, testing on a too small sample and employing a varying definition of a retirement year. In their own study, Murphy and Zimmerman (1993), use a considerably larger sample than previous research and find no evidence of decreases in discretionary spending for retiring CEOs as predicted by the agency theory.

Modern articles also investigate pre-retirement real earnings management of discretionary spending on CSR initiatives (Oh, Chang and Cheng, 2016; Kang, 2016). Oh et al.'s (2016) study on CSR ratings in the US finds no evidence of a CEO horizon problem when proxying retirement through CEO age. However, by adding interaction terms of industry-level discretion and blockholder ownership, the authors show that CEO age has a significant negative impact on CSR ratings.

The first researchers examining the CEO horizon problem based on agency theory predictions outside of the US are Conyon and Florou (2006), studying the phenomenon in a UK setting. The researchers examine if CEO retirement has any effect on R&D spending and capital expenditures and how governance structures may mitigate or accentuate such effects. Their findings indicate no decrease in R&D or capital expenditures prior to a CEO retirement, suggesting no CEO horizon problem in a UK context. Conyon and Florou (2006) do however find several corporate governance factors that mitigate retirement-related agency costs, such as executive dominated boards, stock ownership of and proportion of outside directors, board size and CEO duality[2]. In 2018, Conyon studies the CEO horizon problem from an agency theory perspective outside the US once more together with colleagues Fang and He. Analysing the impact of CEO retirement on managerial slack (proxied by headquarter activity expenses excluding selling and financial expenses), Fang et al. (2018) find support for the CEO horizon problem in a Chinese setting.

3.1.2 Previous Research on the CEO Horizon Problem Based on Agency Theory and CEO Characteristics

The opportunistic behaviour of CEOs prior to retirement has also been related to the individual characteristics of the CEO. The notion that CEO characteristics can affect agency costs is already described by Jensen and Meckling in 1976 and can provide insights to studies by focusing on the observable individual characteristics of a CEO and their influence on organisational outcomes (Hambrick & Mason, 1984). Studies drawing on the agency theory have found that CEO characteristics such as age (Barker & Mueller, 2002; Yim, 2013), tenure length (Hambrick & Fukutomi, 1991) and top management team characteristics (Heyden, Reimer & Van Doorn, 2017), are correlated with fewer firm investments. A tabulation of the articles examining the CEO horizon problem and CEO characteristics based on the agency theory can be found in Appendix, Table 3.

The notion that CEO characteristics can be relevant for studies of the CEO horizon problem has been acknowledged by the contemporary study by Abernethy et al. (2019). The authors, based on identity theory[3], incorporate several CEO characteristics into a variable capturing organisational identification[4] and argue that retiring CEOs who feel close to and identify with

[2] CEO is also Executive Chairman of the Board.

[3] Identity theory and social identity theory originates from two different research areas, social identity theory from psychology (Tajfel, 1982) and identity theory in sociology (Hogg, Terry & White, 1995). While both theories agree that identities shape behaviour in a given context, identity theory focuses more on roles than on social categories as defining identity (Akerlof & Kranton, 2000; Hillman et al., 2008).

[4] In their variable for organisational identification, Abernethy et al. (2019) include: if the CEO has founded the firm, the number of years that the CEO has had been in position, the CEO's share of ownership in the firm, if

their firm will act less opportunistically. Abernethy et al.'s (2019) US study on the CEO horizon problem, based on the agency theory, tests three different dependent variables; R&D expenditures, CSR rating and the number of future year-end earnings forecasts made by the firm in a year. The authors find support for the horizon problem as well as their hypotheses on organisational identification in the models using R&D expenditure and CSR rating as dependent variable, though not for the model including the number of future earnings forecasts.

3.1.3 Inconsistencies in the Agency Theory Based Empirical Literature

In the empirical development of the agency theory-based CEO horizon problem, several inconsistencies are found. Besides the apparent conflicting results in the empiric tests of the CEO horizon problem (see Table 2 and 3), we find that there is still no consensus on what predominant governance controls affect the opportunistic tendencies of CEOs before retirement (see Table 5). For example, post-retirement opportunities, as established being important by Brickley, Link and Coles (1999), are not included in many succeeding articles (cf. Cazier, 2011). Even early established concepts such as relay processes (Dechow & Sloan, 1991) are not consistently included.

Cazier (2011) highlights that inconsistencies in empirical findings may further be related to the research designs employed. Specifically, the author states that the findings in previous literature exhibiting evidence that R&D decreases in CEO pre-retirement years mainly stems from the cross-sectional research design employed. The author argues that studies with research designs allowing to track a CEO over time tend to not find any R&D curtailment. In Cazier's (2011) own study, he finds no evidence of decreases in R&D spending, in line with his hypothesis. On the other hand, subsequent research acknowledging the methodological critique put forward by Cazier (2011) test the CEO horizon problem using panel data and nonetheless find evidence thereof (e.g. Abernethy et al., 2019; Oh et al., 2016).

Criticising the previous dependent variables used to test the relationship between CEO retirement and real or accruals earnings management, Chen et al. (2018) test the CEO horizon problem with a, within the research field, less established method, measuring the level of conditional accounting conservatism. Chen et al. (2018) argue that the complexity of disentangling the tight relationships between real and accruals earnings management leads to incomparable and inconsistent results in previous research.

Adding to these mentioned inconsistencies, the few studies conducted outside of the US context show inconclusive results of the CEO horizon problem. (Conyon & Florou, 2006; Fang et al., 2018).

the CEO was hired from within the firm, the number of roles the CEO has held in the firm and if the CEO has been a department manager before being promoted to CEO.

3.2 The CEO Horizon Problem and the Agency and the Prospect Theory

3.2.1 Previous Research on the CEO Horizon Problem Based on the Agency and the Prospect Theory

Matta and Beamish (2008) are the first authors to empirically and theoretically add the properties of prospect theory to the CEO horizon problem. By combining the agency theory with the prospect theory, the authors develop what they define as the 'accentuated CEO career horizon problem' (Matta and Beamish, 2008). In their study, the authors evidence that the decrease in pre-retirement international acquisitions is accentuated by the value of their equity holdings and in-the-money unexercised options (ibid.). Thereby, Matta and Beamish (2008) empirically show how loss aversion, induced by equity-based compensations, is accentuating the CEO horizon problem rather than mitigating it, as suggested by the agency theory. In other words, equity-based incentives seem to be ineffective in aligning the risk behaviour of the CEO to that of the shareholders in the period before CEO retirement.

Following Matta and Beamish (2008), several subsequent studies investigate the CEO horizon problem based on the combination of the agency and the prospect theory, acknowledging the accentuated model and incorporating equity holdings as either independent or control variables. The empirical research investigates future earnings forecast behaviour (Cassell, Huang & Sanchez, 2013; Alfonso et al., 2019), patent investment behaviour (Xu & Yan, 2014) and capital investments (Silberzahn & Arregle, 2019). For a tabulation of the empirical articles based on the agency theory and the prospect theory, see Table 4 in Appendix.

The US based study by Xu and Yan (2014) takes on a slightly different approach than Matta and Beamish (2008) do, focusing on the difference between vested and unvested options rather than exercised and unexercised options. Xu and Yan (2014) find support for the CEO horizon problem and for their hypothesis that CEO vested option holdings have a negative effect on firms' innovative patents prior to CEO retirements.

A contemporary study on the CEO horizon problem by Silberzahn and Arregle (2019) combine the agency and the prospect theory and add insights in line with the social identity theory. The authors propose that specific CEO backgrounds, and subsequently social identifications, might mitigate the CEO horizon problem (Silberzahn & Arregle, 2019). The authors include indicator variables controlling for if the CEO is the firm's lone founder or if the CEO historically acquired a majority stake in the firm. These CEOs are anticipated to exhibit a strong social identification to the firm, predicted lead to a mitigated opportunistic behaviour. Silberzahn and Arregle (2019) find evidence for the horizon problem and that being a lone founder mitigates the horizon problem on firm capital investments. However, they find no support for their hypothesis that social identification of CEOs that had previously acquired a major stake in the firm mitigates the horizon problem. Furthermore, the authors find evidence that CEO in-the-money option holdings accentuate the CEO horizon problem. In such, the authors deepen the understanding of the 'accentuated CEO career horizon problem' and how it interacts with specific CEO characteristics and their social identification.

3.2.2 Inconsistencies in the Agency and the Prospect Theory Based Empirical Literature

The empirical literature demonstrates inconsistencies in the effects of equity and option-holdings on retiring CEOs and is inconclusive if such incentives will mitigate or accentuate pre-retirement opportunistic behaviour. Evidence for both effects have been found (see Dechow & Sloan, 1991; Abernethy et al., 2019; Matta & Beamish, 2008; Silberzahn & Arregle, 2019). These inconsistencies are in line with those theoretically established by the agency and the prospect theory, as discussed in section 2.4.

3.3 Gaps in Previous Literature

Reviewing the empirical literature, we distinguish four gaps in extant literature on the CEO horizon problem. Firstly, we recognise the lack of studies conducted outside the US. To the best of our knowledge, there are two published articles on the CEO horizon problem outside the US, one conducted in the UK (Conyon & Florou, 2006) and one in China (Fang et al., 2018). Moreover, the articles by Conyon and Florou (2006) and Fang et al. (2018) exhibit inconsistent results. These studies base their predictions on agency theory predictions (Conyon & Florou, 2006; Fang et al., 2018), entailing that as far as we are aware, no study combining the insights from the agency and the prospect theory outside the US currently exist. In addition to recognising the lack of empirical studies made in countries outside the US, we also argue that a further focus on different national contexts and their potential influence on the CEO horizon problem could contribute to the research field. Several researches have argued that the applicability of agency theory is not supranational, and that the level of opportunism is determined by national and social context (Lubatkin, Lane, Collin & Very, 2007). The understanding of opportunism and its relation to agency costs, firm outcomes and CEO behaviour could thus be better understood through taking into account national contexts, corporate structures and governance controls (Lubatkin et al., 2007; Aguilera & Jackson, 2003; Young, Peng, Ahlstrom, Bruton & Jiang, 2008; La Porta, Lopez-de-Silanes, Shleifer & Vishny, 1998). Consequently, we argue that there is a gap in existing research, not only in providing empirical evidence outside of the US, but also in providing insights how national contexts can be relevant in studies on the CEO horizon problem.

Secondly, while the CEO horizon problem is based on the belief that governance controls can mitigate pre-retirement opportunism and agency costs, certain control mechanisms found important by governance literature remain untested in the research field. Therefore, there exists a gap in extant literature, as the mapping of governance mechanisms that affect opportunistic behaviour and the CEO horizon problem, is not yet completed (see Table 5 in Appendix). While we do not aim to complete the mapping, we hope to be able to add insights by investigating the effects of ownership concentration, a corporate governance mechanism based on agency theory (Shleifer & Vishny, 1997). The direct effects of ownership concentration on CEO pre-retirement opportunistic behaviour has, to the best of our knowledge, previously not been tested in the research field of the CEO horizon problem. A strong ownership concentration has been argued to increase firm performance as sizable owners are to a larger extent able to and motivated to put pressure on directors to act more in line with shareholders' desires, compared to a more dispersed ownership structure (Short, 1994; Shleifer & Vishny, 1997; Thomsen &

Pedersen, 2000). Adding to this, ownership concentration tends to have important indirect effects on agency costs due to its interaction with other corporate governance mechanisms, such as having a greater influence on incentive structures (Shleifer & Vishny, 1997). Therefore, to be able to understand the effects of corporate governance in a firm, it is important to understand ownership concentration (ibid.). However, other scholars argue that it is not evident that an increased ownership concentration always leads to an overall better firm performance. For example, the marginal beneficial effect of ownership concentration depends on the complexities of the firm's activities (Li & Simerly, 1998). Moreover, Thomsen and Pedersen (2000) find in their study that the positive effects of increasing ownership concentration diminish after a certain degree of ownership concentration. In the CEO horizon problem research field, few studies have distinctly looked into the direct relationship between ownership concentration and CEO retirement. Previous studies include variables such as blockholder and institutional ownership (e.g. Oh et al., 2016) and the share of ownership belonging to the largest shareholder (Fang et al., 2018). Oh et al. (2016), hypothesise that blockholder ownership increases pre-retirement opportunism, based on the idea that shareholders are short-term oriented, especially when it comes to CSR engagements. This prediction stands in contrast to the general notion of ownership concentration as performance enhancing (Thomsen & Pedersen, 2000) and retiring CEOs being more short-term oriented than shareholders (Dechow & Sloan, 1991). Fang et al. (2018) include ownership concentration as a control variable in their study, although they do not investigate the direct relationship between CEO pre-retirement behaviour and a certain degree of ownership concentration. Thus, we argue that there exists a gap in previous research in terms of understanding the effect of certain governance variables on CEO pre-retirement behaviour, where understanding the effects of ownership concentration seems particularly relevant.

Thirdly, two recent studies by Silberzahn and Arregle (2019) and Abernethy et al. (2019) highlight how further studies related to CEO characteristics, such as social identity and organisational identification, can provide a deeper understanding of the CEO horizon problem. The study by Silberzahn and Arregle (2019) introduce the social identity theory to the CEO horizon problem research field, enticing further understanding of the behaviour of retiring CEOs connected to their social identity. Additionally, social identity theory needs to be understood in the light of different national contexts (Khatri, Tsang & Begley, 2006). We aim to investigate how social identification is expressed and if it can provide further insights into the understanding of retiring CEOs' behaviour in a Swedish setting.

Lastly, there are inconsistent empirical results regarding the existence of a CEO horizon problem. From this viewpoint, we believe additional research of the CEO horizon problem can be motivated in terms of bringing clarity to these inconsistencies.

4. Background to the Swedish Context

Based on the abovementioned gaps, we aim to study the CEO horizon problem in Sweden. As the CEO horizon problem, to the best of our knowledge, has not yet been studied in Sweden, we henceforth aim to establish a foundation of the Swedish context necessary for such an analysis.

4.1 Swedish Principal-Agent Relations

Lubatkin et al. (2005) state that several characteristics of Swedish culture and society have a mitigating effect on agency costs in Sweden. These characteristics include; strong societal norms of equality, low power distance, collective responsibility, cooperation and high morale, which is not as prevalent in US culture and society (Lubatkin et al., 2005). Furthermore, comparing Sweden to the US using Hofstede's (1980) model of national culture, a lower score for Sweden is showcased in four out of five parameters; power distance, uncertainty avoidance, individualism and masculinity (Hofstede & Hofstede, 2005). The low level of masculinity and individualism in Sweden is somewhat disagreeing to agency theory predictions, as these parameters suggest less opportunistic behaviour compared to the US (ibid.). Moreover, Lubatkin et al. (2005) argue that as the agency theory was first developed in the US, it is heavily influenced by the US context. In line with this reasoning, instead of a classic agency theory-based principal-agent relationship, both papers by Lubatkin et al. (2005) and Randøy and Jenssen (2004) open up for other possibly explanatory theories for relations between owners and CEOs in Sweden. The common denominator in these theories is the prediction of the level of opportunism as being lower in a Swedish setting compared to a US setting (Lubatkin et al., 2005; Randøy & Jenssen, 2004). For example, Lubatkin et al. (2005) present the prediction that CEOs in Sweden may not exhibit any motivational issues to act in line with shareholders desires. In summary, the Swedish setting seems to provide a context with potentially little CEO opportunism and small agency costs for shareholders.

4.2 Swedish Corporate Governance

La Porta et al. (1998) establish that it is beneficial to examine a country and its formal corporate governance structure from a macro perspective. Schnyder (2008) categorise Sweden as having an ‘insider-oriented’ corporate governance system, characterised by concentrated ownership, shallow equity markets and a low level of legal protections for minority shareholders. Some aspects of formal Swedish corporate governance seem to stand out in an international context, such as the mandatory employee representative on boards in public firms, boards with exclusively non-executives directors (Carlsson, 2007) and high-income taxes (Lubatkin et al., 2005).

As aforementioned, the Swedish business landscape is characterised by a high industry ownership concentration (La Porta et al., 1998; Lubatkin et al., 2005; Schnyder, 2008). The high ownership concentration is enabled by a dual-class share system and a widespread usage of pyramid and crossholdings ownership (Sinani, Stafsudd, Thomsen, Edling & Randøy, 2008;

La Porta, Lopez-de-Silanes & Shleifer, 1999; Cronqvist & Nilsson, 2003). A dual class shares system entails that some shares have higher voting power, but identical claim on cash flows (Bebchuk, Kraakman & Triantis, 2000). The strong ownership control system in Sweden is argued to lead to several informal corporate governance mechanisms, such as tight networks and social connectedness within corporate networks (Johanson & Østergren, 2010; Carlsson, 2007; Stafsudd, 2009). Sinani et al. (2008) find that Sweden has a small managerial labour market with tight connections, entailing strong control mechanisms through external monitoring effects where informal controls are argued to be more influential the tighter the network (Stafsudd, 2009).

The high ownership concentration stems from a tradition of large business groups (interchangeably used with spheres) with a long history, generally controlled by influential families (Carlsson, 2007; Lubatkin et al., 2005; Sinani et al., 2008). The two main business groups are the Wallenberg and the Handelsbanken sphere, though other less prominent spheres exist (Sinani et al., 2008; Carlsson, 2007). While high ownership concentration enables the existence of spheres, spheres in turn have distinct effects on the CEOs within the spheres, through for example large networks and career opportunities (Carlsson, 2007). Furthermore, the informal corporate governance mechanisms seem to have a special role within spheres. Collin (1993) argues that Swedish business spheres lead to a 'brotherhood', distinguished by relations built on trust and a tight network. The managers of companies in such spheres have to a larger extent been found prioritise long-term stakeholders of the firm (Li, 1994). In Sweden, it has been further established that rather than there being competition between CEOs, there is competition between spheres, and while managers may lose their job in one firm, they are often hired in another firm within the same sphere (Lubatkin et al. 2005; Carlsson, 2007; Collin 1993).

5. Hypothesis

We wish to test the CEO horizon problem in Sweden. Several authors have argued that the Swedish context suggests little opportunistic behaviour in principal-agent relations (e.g. Lubatkin et al., 2005). While we recognize the argument of low opportunistic behaviour in Swedish principal-agent relations, we, similarly to Gomez-Meija and Wiseman (2007), hold that opportunism is situational and depend on more than a national context. Therefore, we believe that the motivation to act opportunistically prior to retirement can still exist in a Swedish setting. That is, the agency theory is still applicable and can explain situations of opportunistic behaviour, even in a seemingly low opportunistic context. To conclude, we expect that retiring CEOs in Swedish listed firm will decrease firm investments, indicating pre-retirement opportunism and existence of the CEO horizon problem among retiring CEOs in Swedish listed firms.

Thus, our hypothesis is as following:

1. *The retirement of a CEO has a negative effect on firm investments in Sweden*

Ownership concentrations seems to be an important governance mechanism that could mitigate a manager's opportunistic behaviour (see section 3.3). Furthermore, since the Swedish business context has a common occurrence of high ownership concentration, conducting a study on Swedish firms presents an opportunity to test how ownership concentration affects the predictions of the CEO horizon problem. Therefore, we hypothesise that a higher ownership concentration is a governance mechanism that can influence CEOs to act more in the line with shareholders, decreasing opportunistic behaviour of retiring CEOs in Sweden.

Hence, our second hypothesis is:

2. *Higher ownership concentration positively impacts the relationship between CEO retirement and firm investments in Sweden*

Studying CEOs employed in Swedish business spheres introduces an opportunity to further understand how social identification can impact pre-retirement opportunism and the alignment of a CEO's actions to shareholder objectives. The social identity theory dictates that an individual will take those actions that it deems to be best in terms of its perceived social category (Hillman et al., 2008; Ashforth & Mael, 1989). Alas, the individual perceives its fate and the social category's fate as one (Ashforth & Mael, 1989). We propose that the argued connection between a CEO and the Swedish business sphere in which they work is closely related to the theory of social identification (see section 4.2.). Similar to what Hillman et al. (2008) argue regarding directors, we suggest for CEOs. That is, CEOs that are part of a sphere could potentially feel: "I am a [sphere-name]-CEO". Several authors have argued that business spheres exhibit certain social characteristics. Smångs (2006) argues that a business sphere is maintained by the social mechanisms of reciprocity, that members of the sphere display a strong 'sense of belonging' and that business spheres are carriers of social capital. By applying

the antecedents of social identification developed by Ashforth and Mael in 1989[5], to the characteristics of Swedish spheres, we argue that there theoretically could exist social identification for CEOs towards spheres (see Table 6). Social identification to spheres implies a congruence between a CEO's goals and those of the sphere, potentially leading retiring CEOs to become more long-term focused and less opportunistic. From this reasoning, we suggest that retiring CEOs with positions in firms that are a part of a sphere who exhibit certain social identification characteristics to that sphere will act more in line with shareholders, positively impacting the relationship between CEO retirement and firm investment in Sweden.

Our last hypothesis is thus:

3. *Social identification to a Swedish business sphere positively impacts the relationship between CEO retirement and firm investments in Sweden*

[5] These antecedents are, (1) group distinctiveness (within and between), (2) perceived external prestige, (3) out-group salience, (4) inter-group competition and (5) factors associated with group formation. To these five, we argue the addition of 'degree of contact between employee and organisations' as put forward by Mael and Ashforth in 1992.

6. Method

6.1 Research Design

The operationalisation of the posed research question is conducted through a correlational longitudinal study, running four main multivariate regressions, quantitatively analysing the relationship between firm investments to the retirement of CEOs. The way in which we choose to construct our study has implications for our results. The research design in previous studies in the CEO horizon problem field has been problematised by Cazier (2011), arguing that the preceding studies conducting cross-sectional datasets exhibit evidence for the CEO horizon problem to a greater extent than the preceding studies using panel data have. We wish to bypass this potential bias through employing panel data, including data over time in the years 2001-2017 and between firms.

In our first regression model, we follow Silberzahn and Arregle's (2019) regression Model 2[6], applying Swedish data though performing certain adjustments to variables. Following a previous study is beneficial since our study uses data from a country where the CEO horizon problem has not yet been investigated. Through this application, we therefore hope to more accurately capture the same effects of the variables as previous research. Silberzahn and Arregle's (2019) study is a recent study incorporating many aspects and variables found important in extant literature. The study considers the insights from both the agency and the prospect theory, which is in line with contemporary literature.

Our second regression model, which is used as a base for all consecutive models, add control variables to regression model 1. Although not recognised by Silberzahn and Arregle (2019), the importance of these control variables has been established in previous research and the variables are predicted to have an impact on the tested relationship. The motivation for the inclusion of these variables is found in the variable description in section 6.2.3. Regression model 1 and 2 test our first hypothesis; whether the CEO horizon problem is prevalent in a Swedish setting. In regression model 3, the impact of ownership concentration on the relationship between CEO retirement and firm investments is investigated. In regression model 4, we examine whether being part of and exhibiting social identification characteristics to a Swedish sphere has an impact on the relationship between CEO retirement and firm investment. The dependent variable in the regression models, firm investment, is represented by net capital expenditures. The exact measure of net capital expenditures is developed in section 6.2.1. Moreover, for details of how the different independent variables, CEO retirement, ownership concentration and 'social identification to sphere', are approximated, see section 6.2.2. In section 6.2.3, we describe our motivation for the included control variables. Lastly, we present how we will test our hypotheses in section 6.3.

[6] See page 350 in Silberzahn & Arregle, 2019.

6.2 Variable Description

6.2.1 The Dependent Variable

The CEO horizon problem has been tested using various measures of the dependent variable, although most studies investigate the problem from a financial perspective, examining the effect of CEO retirement on firm investments (e.g. Dechow & Sloan, 1991; Conyon & Florou, 2006; Silberzahn & Arregle, 2019). The usage of firm investments as the dependent variable is based on the presumption that the CEO has high discretion over such firm strategic decisions (e.g. Hambrick & Finkelstein, 1987). To approximate firm investments, both R&D spending and capital expenditures are used as dependent variables in previous research (see Table 12). Capital expenditures are argued to be preferred over R&D spending as R&D spending varies largely between industries, and some firms do not have any R&D expenditures at all (Miller & Bromiley, 1990). Therefore, using R&D spending as the dependent variable in testing the CEO horizon problem could entail non-generalisable findings (Silberzahn & Arregle, 2019). Applying this position, our dependent variable is the continuous variable firm net capital expenditures ($CAPEX$).

$$CAPEX_{i,t} = \frac{net\ CAPEX_{i,t}}{PPE_{i,t-1}} = \frac{PPE_{i,t} - PPE_{i,t-1} + depreciation_{i,t}}{PPE_{i,t-1}} \quad (1)$$

Following the study by Silberzahn and Arregle (2019) we measure the net capital expenditures as a ratio of net capital expenditures over the asset value of the property, plants and equipment (PPE). We use net capital expenditures as the numerator with the assumption that opportunistic improvements of firm cash flows and earnings not only can be achieved through decreasing capital expenditures, but also through sales of fixed assets. Capital expenditures are risky investments realised over a long period of time (Kothari, Laguerre & Leone, 2002) and retiring CEOs face a disincentive to invest in assets with returns not realised prior to their departure (Conyon & Florou, 2006; Silberzahn & Arregle, 2019). Also, a decrease in these types of investments have a near-term positive impact on both cash flow, through decreased costs of investments, and on the result through decreased costs of depreciation. The short-term increase in firm cash flow and result and decrease in risky capital expenditures can in turn be favourable for a retiring CEO with only a short time left in position. These predictions are based on the following agency and prospect theory presumptions respectively; (1) short-term incentives are earnings-based (Dechow & Sloan, 1991) and (2) a decreased riskiness of the firm in turn leads to decreased risk of firm-endowed wealth in equity and option holdings (Matta & Beamish, 2008). Furthermore, firm capital expenditures have been argued to capture managerial orientation, as decreases in capital expenditures signal a short-term orientation and increases signal a focus on future earnings and cash flow (Gupta & Bailey, 2001). The dependent variable, net capital expenditures as a proportion of the value of the property, plant and equipment is winsorized at the 2.5% and 97.5% levels to mitigate outlier effects. The level of winsorization is chosen as several observations assume exceptional values due to remarkably small denominators as some firms have little or non-existent PPE.

6.2.2 Independent Variables

The pre-retirement (horizon) period of the CEO has been captured in diverse ways in previous research. Studies by Matta and Beamish (2008) and Silberzahn and Arregle (2019) use time to retirement as an independent variable, applying a predetermined retirement age and deducting the current age of the CEO to receive the length left of the career. Several studies have identified real turnover events to subsequently either cross checking these manually to find retirements (Conyon & Florou, 2006; Cassell et al., 2013) or using CEO age as an indicator of the turnover being a retirement (Dechow & Sloan, 1991; Davidson et al., 2007). Also, certain studies simply use a certain age as a proxy for a pre-retirement period (e.g. Oh et al., 2016).

In our estimation of the CEO horizon, we use an indicator variable capturing the retirement year. To identify CEO retirements, we combine several methods. Firstly, we identify turnover events where a CEO has not worked as a CEO in any Swedish listed or non-listed firm following the turnover event. To complement these findings, we also set an age limit where the identified turnover event can only be classified as a retirement if the CEO is above 58 years of age. The age parameter is included as it is assumed that the older the CEO is at the point of a turnover event, the less concerned he or she is about potential future career prospects outside a CEO role. The selection of an age limit of 58 years is motivated by the aim to capture early retirements before the official pension age of 65[7] (Pensionsmyndigheten, 2020). Moreover, many firms in the early 2000's had a final retirement age for CEOs of 60 (Wäingelin, 2004), which we need to take into account since our dataset ranges between the years 2001-2017. Next, we construct our independent variable, the indicator variable ($retire$), which will take on a value of 1 if the observation is the last full year before the CEO retirement occurs. In our analysis, we focus on retirements from the CEO role, which entails that individuals that have retired from the CEO role and have taken another role, such as a board position, subsequent to the last CEO position (and above the age of 58), are seen as retired. Even though we conduct several measures to find CEO retirements, our method does not capture CEOs that have started working as CEOs in companies with residence outside of Sweden as our dataset only contains Swedish private and public firms. It should furthermore be noted that the construction of our dataset entails that there can only be one CEO per year which is the last CEO during any given year.

In addition to the variable for retirement, regression model 3 and 4 contain additional independent variables. In regression model 3, we include a continuous variable for ownership concentration and an interaction term for ownership concentration with retirement ($ownercon \times retire$). While there are several ways to measure ownership concentration, they all aim to measure shareholders' power to influence manager decisions (Short, 1994; Thomsen & Pedersen, 2000). Our variable of ownership concentration indicates the percentage of votes held by the three largest shareholders in each respective firm and year.

Moreover, in the last regression, regression model 4, we include an indicator variable for CEOs that showcase certain social identification characteristics to a business sphere ($sphere$) and an

[7] Commonly, the retirement age of CEOs of Swedish listed firms is based on collective agreements (such as the ITP). Presently, these agreements state a retirement age of 65, although it has been a subject to change over the years (Wallberg, 2004).

interaction term for retirement and the 'social identification to sphere' variable ($sphere \times retire$). To develop the indicator variable, we first construct a set of criteria that we theoretically argue would be able to capture if a retiring CEO socially identifies with a sphere. The criteria of social identification and their theoretical motivation are based primarily on research by Ashforth and Mael (1989) and Hillman et al. (2008). Specifically, we hold that the model on social identity of directors, as developed by Hillman et al. (2008), is applicable in the relationship between spheres and CEOs. We argue that social identification to spheres represent a type of hybridity between social identification towards the categories of 'organisation' and 'shareholders' in Hillman et al.'s (2008) model. Therefore, we argue that characteristics of social identification to owners and organisations based on the Hillman et al. (2008) model, has the potential to capture social identification to spheres. As Hillman et al. (2008) suggest that not all of the criteria (1-5) are necessarily to hold at the same time for social identification to exist, the indicator variable will showcase an identification if either the conditions 1-3 are fulfilled or conditions 1-2 and 4-5. See Table 7 for a full disclosure of the criteria and underlying motivations for the construction of our indicator variable on 'social identification to spheres'.

6.2.3 Control Variables

To control for other factors potentially affecting the relationship between CEO retirement and net capital expenditures, we include several control variables in our models. See Table 8 in Appendix for a summary of the classifications and definitions of the control variables. We include variables for CEO characteristics as well as firm and industry specific variables. The included control variables for CEO characteristics are believed to impact the opportunistic behaviour of the CEO prior to retirement. We control for the education level of the CEO[8] ($CEOedu$), as it has been found that CEOs with higher levels of education are more open to risky investments and innovation (Wiersema & Bantel, 1992). The tenure of a CEO, the number of years that the CEO has been in the same position ($CEOtenure$), has been argued to affect CEO behaviour, and there is evidence that a longer tenure can both increase and decrease firm investments (Hambrick & Fukutomi 1991; Barker & Mueller, 2002). Based on agency theory predictions, a longer CEO tenure is assumed to decrease CEO opportunism as the efficiency of a principal-agent relationship is argued to increase with time (Eisenhardt, 1989). Furthermore, we include an indicator variable for relay processes ($relay$). The prediction that a, as per Vancil (1987) defined, relay process is an important component to the CEO horizon problem is already recognised by Dechow and Sloan in 1991 and has been evidenced in subsequent studies (Xu & Yan, 2014; Silberzahn & Arregle, 2019). The relay process is predicted to have an impact on the potentially opportunistic pre-retirement behaviour, making CEOs less incentivised to act opportunistically as they are staying in the firm through a board position. We define a relay process as a turnover event where the departing CEO takes a board position subsequent to the departure and that the new CEO is hired internally. This variable can also be seen as a partial control for post-retirement board opportunities, as put forward by Brickley et al. (1999).

[8] Education levels are defined as having completed the highest level of the following; 0 = no education, 1 = elementary school, 2 = high school, 3 = undergraduate degree, 4 = postgraduate degree, 5 = postdoctoral degree.

CEO compensation and compensation structure can have an impact on the CEO's willingness to engage in firm investments (Wiseman & Gomez-Meija, 1998; Kalyta, 2009; Cheng, 2004, Smith & Watts, 1992). We include continuous variables capturing CEO compensation in form of CEO base salary ($CEOsalary$), CEO short-term incentives (STI) ($CEOSTI$) and CEO long-term incentives (LTI) ($CEOLTI$). We separate the base salary from CEO long- and short-term incentives as previous research has found that CEOs regard risk-bearing compensation differently from guaranteed compensation (Wiseman & Gomez-Meija, 1998). What is included in CEO LTI is not always specified in company annual reports. The variable commonly includes option and equity instrument, although not exclusively. Similar to Abernethy et al. (2019), we include an indicator variable capturing if the short-term incentives are based on earnings-based results solely, that is short-term incentives based on revenue, operational results or cash flow measurement ($earnbased$). This distinction is relevant as CEO short-term incentives could be based on more than earnings, such as stock price development and non-financial objectives. From an agency theory perspective, a compensation based on earnings would further incentivise a retiring CEO to act opportunistically (Dechow & Sloan, 1991; Murphy & Zimmerman, 1993). Furthermore, including an earnings-based indicator variable moves the focus from the size of the value of the CEO STI to the structure of the compensation, which through its mere existence might incentivise opportunistic behaviour. Moreover, we control for CEO firm-endowed wealth through a continuous variable of how many shares the CEO owns out of the total shares in the firm ($CEOshares$) and an indicator variable for CEO option holding ($CEOoption$). As described in section 2.2.1, firm-endowed wealth has been proven to affect CEO pre-retirement opportunistic behaviour. However, the research field is divided by the predictions of the agency and the prospect theory respectively (e.g. Dechow & Sloan, 1991; Matta & Beamish, 2008). Further, CEO option holding value has been included and proven to be a relevant control variable in previous studies (e.g. Matta & Beamish, 2008; Abernethy et al., 2019). However, due to lack of data we are not able to construct a continuous variable on option holding value. Thus, in our test, only equity ownership will capture the magnitude of firm-endowed wealth. The lack of data could lead to less explanatory results of the option holding variable and might not capture the predicted risk-aversion related to these holdings (Matta & Beamish, 2008). Furthermore, we are unable to make the distinction between different types of options (for example unvested, vested and in-the-money) as some previous researchers have done (Matta & Beamish, 2008; Xu & Yan, 2014).

Additionally, we include variables to control for differences between firms that could impact the result of our study. These variables control for the resources available and ability to invest as well as the future outlook of the firm. We include a discrete control variable on firm age ($firmage$), since older firms have been found to exhibit lower probability of innovation (Huergo & Jaumandreu, 2004) and are prone to have more rigorous processes for investments (Silberzahn & Arregle, 2019). Furthermore, a variable for previous firm performance is included as it may serve as a point of reference for future investments (Wiseman & Gomez-Mejia, 1998). The previous firm performance is captured by a continuous variable (ROA) and is approximated by the percentage of return on assets.

$$ROA_{i,t-1} = \frac{net\ income_{i,t-1}}{total\ assets_{i,t-2}} \quad (2)$$

Moreover, the size of the firm can have an impact on the availability of resources to invest and corporate activities have been found to be related to the size of the firm (Gala & Julio, 2016; Silberzahn & Arregle, 2019; Abernethy et al., 2019; Kang, 2013). The discrete variable on firm size ($size$) is approximated using the number of employees, as estimated by Silberzahn and Arregle (2019) and Matta and Beamish (2008). Further, we also include a variable for Tobin's Q ($TobinsQ$), which measures the market value of total assets over the book value of total assets (Ross, Westerfield & Jordan, 2016), argued to capture the growth opportunities of the firm, predicting that firms with better growth opportunities will invest more (Silberzahn & Arregle, 2019; Cazier, 2011; Hartzell & Starks, 2003).

$$TobinsQ_{i,t-1} = \frac{Total\ market\ value\ of\ firm_{i,t-1}}{Total\ book\ value\ of\ firm_{i,t-1}} \quad (3)$$

Furthermore, we include a continuous variable for previous free cash flow (FCF), representing resources available for firm investments in the current year (Cazier, 2011; Kang, 2016). The size of free cash flow has been found to be related to the amount and what type of capital expenditures firms undertake (Jensen, 1986).

$$FCF_{i,t-1} = EBIT_{i,t-1} + taxes_{i,t-1} + depreciation_{i,t-1} - \left(\Delta current\ assets_{i,t-1} - \Delta \text{current liabilities}_{i,t-1}\right) \quad (4)$$

Similarly, the variable leverage ratio ($leverage$) captures the resources available for investment on the debt market (Lang, Ofek & Stulz, 1996; Kang, 2016). Additionally, the leverage ratio gives an indication of the monitoring by the debt market (Abernethy et al., 2019).

$$leverage_{i,t-1} = \frac{total\ liabilities_{i,t-1}}{total\ assets_{i,t-1}} \quad (5)$$

Lastly, we wish to address potential self-selection problems that can impact our study (Hamilton & Nickerson, 2003). As the dependent variable CEO retirement is non-random, that is retirement could happen for unobservable reasons, it might cause an endogeneity problem. For example, the CEO might want to retire, or the firm might require the CEO to retire for some unobservable reasons. Further, if these unobservable reasons are correlated to our dependent variable of net capital expenditures, an endogeneity problem would appear. To deal with this problem we have applied a Heckman (1979) two-stage model, calculating the Inverse Mills ratio (IMR) running a probit regression model for the first stage to control for unobserved measures (see Table 9). We winsorize all continuous variables at the 1% and 99% level to mitigate outliers' effects.

6.2.4 Fixed Effects

In this section we wish to address the arrangement of our dataset. As mentioned above, we employ panel data, implying a need for running fixed effects regressions to control for "unobservable or unmeasurable characteristics that do not vary over time" (Hill, Davis, Roos & French, 2019). To determine whether a fixed effects model is deemed more appropriate compared to a random effects model, we run a Hausman specification test. The test specifies a null hypothesis of no correlation between the regressors and the unique errors in the regression.

Accepting the null hypothesis implies a need for applying a random effects model, and the rejection thereof implies a need for fixed effects. The test leads to a rejection of the null hypothesis at a 0.1% significance level. Thus, all of our multivariate regression models are run with fixed effects with standard errors clustered on firms. Reviewing the extant literature on the CEO horizon problem conducting tests on panel data, most of these control for year and industry fixed effects (Silberzahn & Arregle, 2019; Abernethy et al., 2019; Kalyta, 2009; Chen et al., 2018; Fang et al., 2018; Yim, 2013). However, as our data also consists of two other time invariant parameters, those for each individual firm and each individual CEO, running fixed effects on firm and CEO level is also a possibility. Such procedure is further likely to allow the regression to control for differences between observations that are not only due to a specific year or industry but also variation within firms and within CEOs. Although not yet a routine in economics literature (Andrews, Schank & Upward, 2006), including fixed effects on all four parameters could imply a more accurate test (Hill et al., 2019). However, due to the nature of our data, including fixed effects on a firm and/or a CEO level could potentially provide less significant results, which in turn could be a reason for why previous studies have chosen not to control for firm and CEO fixed effects. The reduced significance on variables when adding fixed effects on firm and CEO is caused by the lack of variation in the variables and the fact that fixed effects can reduce sample size (Hill et al., 2019). Further, the limited number of time periods (years) in relation to the number of firms and CEOs can lead to coefficients being biased in a conservative manner when controlling for firm or CEO fixed effects (ibid.). As our independent variable, ($retire$), only takes on value 1 for the year of retirement for CEOs, there is little variability in the variable which thus can be affected by the application of fixed effects (ibid.). Summarising this passage on fixed effects, there are both advantages and disadvantages with controlling for fixed effects for all variables. Therefore, we will present two versions of each regression model where one follows previous studies within the CEO horizon problem research field, controlling for year and industry fixed effects, and the other controls for all fixed effects mentioned.

6.3 Hypothesis Testing

6.3.1 Hypothesis 1

To test our first hypothesis, investigating the effect of CEO retirement on firm net capital expenditures, we run two multivariate regressions on firm net capital expenditures ($CAPEX$) against the indicator variable for CEO retirement in a firm ($retire$) and an array of control variables. The first regression model follows the study made by Silberzahn and Arregle (2019) and the second model includes the addition of two control variables (see Table 10 in appendix for a comparison between regression model 1 and Silberzahn and Arregle's 2019 model). In that sense, regression model 2 does not add a new independent variable. The variables on relay processes and earnings based variable pay have been evidenced to impact the retiring CEO opportunistic behaviour and are anchored in theory ($earnbased, relay$) (see section 6.2.3).

Regression model 1 for firm net capital expenditures (two-way fixed effects) is defined as:

(6)

$$CAPEX_{i,t} = \propto + \beta_1 retire_{i,t} + \beta_2 CEOsalary_{i,t} + \beta_3 CEOSTI_{i,t} + \beta_4 CEOoption_{i,t} + \beta_5 CEOshares_{i,t} + \beta_6 CEOLTI_{i,t} + \beta_7 CEOedu_{i,t} + \beta_8 CEOtenure_{i,t} + \beta_9 firmage_{i,t} + \beta_{10} ROA_{i,t-1} + \beta_{11} size_{i,t-1} + \beta_{12} leverage_{i,t-1} + \beta_{13} FCF_{i,t-1} + \beta_{14} TobinsQ_{i,t-1} + \beta_{15} IMR + \lambda_t + \delta_j + \varepsilon_{i,t}$$

Where:

i: indicates firm i

t: indicates year t

j : indicates industry j

$CAPEX_{i,t}$ = net capital expenditures over PPE

$retire_{i,t}$ = 1 for last full year prior to CEO retirement

$CEOsalary_{i,t}$ = CEO base salary in MSEK

$CEOSTI_{i,t}$ = CEO STI in MSEK

$CEOoption_{i,t}$ = 1 if CEO hold firm options

$CEOshares_{i,t}$ = percentage of firm owned by CEO

$CEOLTI_{i,t}$ = CEO LTI in MSEK

$CEOedu_{i,t}$ = takes on value 0-5 depending on education level[9]

$CEOtenure_{i,t}$ = natural logarithm of number of years that the CEO has been in position

$firmage_{i,t}$ = natural logarithm of number of years that firm has existed

$ROA_{i,t-1}$ = lagged net income divided by two-year lagged total asset value

$size_{i,t-1}$ = lagged natural logarithm of number of employees

$leverage_{i,t-1}$= lagged leverage ratio

$FCF_{i,t-1}$ = lagged free cash flow scaled by sales

$TobinsQ_{i,t-1}$ = lagged Tobin's Q

IMR = Inverse Mills ratio from first-stage probit regression model

λ_t = Year fixed effects

δ_j = Industry fixed effects

Regression model 2 for firm net capital expenditures (two-way fixed effects) is defined as:

$$CAPEX_{i,t} = \propto + \beta_1 retire_{i,t} + \beta_2 CEOsalary_{i,t} + \beta_3 CEOSTI_{i,t} + \beta_4 CEOoption_{i,t} + \beta_5 CEOshares_{i,t} + \beta_6 CEOLTI_{i,t} + \beta_7 CEOedu_{i,t} + \beta_8 CEOtenure_{i,t} + \beta_9 firmage_{i,t} + \beta_{10} ROA_{i,t-1} + \beta_{11} size_{i,t-1} + \beta_{12} leverage_{i,t-1} + \beta_{13} FCF_{i,t-1} + \beta_{14} TobinsQ_{i,t-1} + \beta_{15} IMR + \beta_{16} relay_i + \beta_{17} earnbased_{i,t} + \lambda_t + \delta_j + \varepsilon_{it} \quad (7)$$

Where:

[9] The subscript i,t (indicating firm and year) indicates the education of the CEO in a firm a given year.

i: indicates firm i

t: indicates year t

j : indicates industry j

$relay_i$ = 1 if turnover is conducted through a relay process

$earnbased_{i,t}$ = 1 if CEO STI is based on earnings-based results

$CAPEX_{i,t}$, $retire_{i,t}$, $CEOsalary_{i,t}$, $CEOSTI_{i,t}$, $CEOoption_{i,t}$, $CEOshares_{i,t}$, $CEOLTI_{i,t}$, $CEOedu_{i,t}$, $CEOtenure_{i,t}$, $firmage_{i,t}$, $ROA_{i,t-1}$, $size_{i,t-1}$, $leverage_{i,t-1}$, $FCF_{i,t-1}$, $TobinsQ_{i,t-1}$, IMR, λ_t and δ_j is defined as in model 1

Our previously stated hypothesis implies a null hypothesis for both model 1 and 2 with a coefficient for ($retire$) being zero, indicating no relationship between the net capital expenditures and CEO retirement. Moreover, the alternative hypothesis states a negative relationship between CEO retirement and net capital expenditures and a negative coefficient for ($retire$). An interpretation of the alternative hypothesis suggests that there is a prevalence of the CEO horizon problem in Sweden:

$$H_0: \beta_1 = 0$$

$$H_1: \beta_1 < 0$$

6.3.2 Hypothesis 2

The second hypothesis, tested by regression model 3, is related to the predicted mitigating effect ownership concentration has on a retiring CEO's opportunistic behaviour. The variable of ownership concentration ($ownercon$), is included as an interaction term with CEO retirement in the second model ($ownercon \times retire$). To test our second hypothesis, whether higher ownership concentration positively impacts the relationship between net capital expenditures and CEO retirement, we run a third multivariate regression.

Regression model 3 for firm net capital expenditures (two-way fixed effects) is defined as:

$$\begin{aligned} CAPEX_{i,t} = \propto + & \beta_1 retire_{i,t} + \beta_2 ownercon_{i,t} + \beta_3 ownercon_{i,t} \times retire_{i,t} + \\ & \beta_4 CEOsalary_{i,t} + \beta_5 CEOSTI_{i,t} + \beta_6 CEOoption_{i,t} + \beta_7 CEOshares_{i,t} + \beta_8 CEOLTI_{i,t} + \\ & \beta_9 CEOedu_{i,t} + \beta_{10} CEOtenure_{i,t} + \beta_{11} firmage_{i,t} + \beta_{12} ROA_{i,t-1} + \beta_{13} size_{i,t-1} + \\ & \beta_{14} leverage_{i,t-1} + \beta_{15} FCF_{i,t-1} + \beta_{16} TobinsQ_{i,t-1} + \beta_{17} IMR + \beta_{18} relay_i + \\ & \beta_{19} earnbased_{i,t} + \lambda_t + \delta_j + \varepsilon_{i,t} \end{aligned} \quad (8)$$

Where:

i: indicates firm i

t: indicates year t

j : indicates industry j

$ownercon_{i,t}$ = percentage of voting rights belonging to the three largest shareholders

$ownercon_{i,t} \times retire_{i,t}$ = the effect that ownership concentration has on net capital expenditures in firms with a retiring CEO

$CAPEX_{i,t}$, $retire_{i,t}$, $CEOsalary_{i,t}$, $CEOSTI_{i,t}$, $CEOoption_{i,t}$, $CEOshares_{i,t}$, $CEOLTI_{i,t}$, $CEOedu_{i,t}$, $CEOtenure_{i,t}$, $firmage_{i,t}$, $ROA_{i,t-1}$, $size_{i,t-1}$, $leverage_{i,t-1}$, $FCF_{i,t-1}$, $TobinsQ_{i,t-1}$, IMR, λ_t, δ_j, $relay_i$ and $earnbased_{i,t}$ is defined as in model 2

The null hypothesis for regression model 3 states no relationship between the interaction term of ownership concentration and CEO retirement ($ownercon \times retire$) and the dependent variable ($CAPEX$). The alternative hypothesis for regression model 3 implies that the coefficient for the interaction term (β_3) is positive:

$$H_0: \beta_3 = 0$$

$$H_1: \beta_3 > 0$$

6.3.3 Hypothesis 3

To test our third hypothesis, whether socially identifying with a Swedish business sphere has a positive impact on the relationship between net capital expenditures and CEO retirements, we run a fourth multivariate regression. In this regression, we include an interaction term between the indicator variable 'social identification to sphere' and the variable for CEO retirement ($sphere \times retire$), again running the regression on firm net capital expenditures ($CAPEX$) and an array of control variables.

Regression model 4 for firm net capital expenditures (two-way fixed effects) is defined as:

$$\begin{aligned} CAPEX_{i,t} = \propto + \beta_1 retire_{i,t} + \beta_2 sphere_{i,t} + \beta_3 sphere_{i,t} \times retire_{i,t} + \beta_4 CEOsalary_{i,t} + \\ \beta_5 CEOSTI_{i,t} + \beta_6 CEOoption_{i,t} + \beta_7 CEOshares_{i,t} + \beta_8 CEOLTI_{i,t} + \beta_9 CEOedu_{i,t} + \\ \beta_{10} CEOtenure_{i,t} + \beta_{11} firmage_{i,t} + \beta_{12} ROA_{i,t-1} + \beta_{13} size_{i,t-1} + \beta_{14} leverage_{i,t-1} + \\ \beta_{15} FCF_{i,t-1} + \beta_{16} TobinsQ_{i,t-1} + \beta_{17} IMR + \beta_{18} relay_i + \beta_{19} earnbased_{i,t} + \lambda_t + \delta_j + \varepsilon_{i,t} \end{aligned} \quad (9)$$

Where:

i: indicates firm i

t: indicates year t

j : indicates industry j

$sphere_{i,t}$ = 1 if the CEO exhibit characteristics of social identification to a business sphere

$sphere_{i,t} \times retire_{i,t}$ = the effect that exhibiting characteristics of social identification to a business sphere has on net capital expenditures in firms with a retiring CEO

$CAPEX_{i,t}$, $retire_{i,t}$, $CEOsalary_{i,t}$, $CEOSTI_{i,t}$, $CEOoption_{i,t}$, $CEOshares_{i,t}$, $CEOLTI_{i,t}$, $CEOedu_{i,t}$, $CEOtenure_{i,t}$, $firmage_{i,t}$, $ROA_{i,t-1}$, $size_{i,t-1}$, $leverage_{i,t-1}$, $FCF_{i,t-1}$, $TobinsQ_{i,t-1}$, IMR, λ_t, δ_j, $relay_i$ and $earnbased_{i,t}$ is defined as in model 2

As in the previous regression model, the null hypothesis states no relationship between the interaction term between the variable on 'social identification to sphere' and CEO retirement ($sphere \times retire$) and net capital expenditures. Thus, the alternative hypothesis for regression model 4 implies that the coefficient for the interaction term (β_3) is positive:

$$H_0: \beta_3 = 0$$

$$H_1: \beta_3 > 0$$

6.4 Data Processing and Sample Selection

We limit our dataset to firms listed between the years 2001-2017 in the Stockholm Stock Exchange in the segments Small, Mid and Large Cap, as well as 'A-listan' and 'O-listan' for the years before the reclassification of the categories in the Stockholm Stock Exchange in 2006. This entails a sample selection bias towards large firms. Adding to this, we include both currently listed and delisted firms. The data on all the firms listed in the selected time period is obtained from the Swedish House of Finance and is later merged with a dataset from Nasdaq Nordic's webpage to obtain the Swedish organisation numbers for all currently listed firms. For the delisted firms, we gather the organisation number ourselves through the directories of the Swedish tax authorities' website. The dataset from Nasdaq also contains industry classification for all the currently listed firms. These classifications are subsequently applied to the delisted firms using information from the annual editions of the book "Owners and Power in Sweden's Listed Companies" (Ägarna och Makten) (Sundin & Sundqvist, 2001-2015). The first sample contains 4,696 observations and is next limited to firms with Swedish residence to be able to match our dataset on Swedish year-end annual report data. See Table 11 for detailed information on the development of our sample. By removing the firms with residence outside of Sweden, firms that are listed only in other countries than Sweden and firms that have been listed less than two years, we obtain a dataset of 4,161 observations.

Next, the adjusted dataset is merged with two additional datasets. The first dataset contains year-end annual report data, obtained from the Serrano database provided by the Swedish House of Finance. This dataset does not contain data on Swedish joint stock banks, entailing that 82 observations drop from our sample. To obtain data on CEO and board member turnover, we access an anonymised dataset (Anonymised Board Data) including data on board members and CEOs in all public and private Swedish firms, generously provided by the Accounting Department at the Stockholm School of Economics. The Serrano database includes the data needed to construct our dependent and firm specific financial variables. The Anonymised Board Dataset includes the data needed to create the variables on CEO retirement and tenure. Both of these two aforementioned datasets have missing data for certain observations on firm financials and on CEO data. Therefore, our sample drops by 538 observations when joining these datasets. All of our observations dropped during the development of our sample are believed to be random, why there should not persist any sample selection bias due to the missing data. For the variable firm age, we use the registration date for the firm, collected through the business database Retriever.

Next, we hand collect CEO compensation data reviewing annual reports between the years 2001-2017. This is conducted through reviewing public annual reports for each year, gathering data on CEO education, base salary, STI and LTI and whether the CEO STI it is based on earnings. We primarily use annual reports, but use desktop search when necessary, to collect information on CEO education levels. The numbers of observations drop by 11 due to company annual reports not found.

The identification of business spheres and the firms therein was conducted using the annual editions of the book "Owners and Power in Sweden's Listed Companies" (Ägarna och Makten) (Sundin & Sundqvist, 2001-2015) between the years 2001-2015. For the years 2016-2017 we researched whether the companies that were in a sphere 2015, were still part of that sphere in the consecutive years or if any new firms were acquired by the sphere through reviewing annual reports and ownership data of the firms.

The data on whether the CEO hold firm-specific options and shares are obtained from the PDMR transaction dataset from the Swedish Financial Supervisory Authority (Finansinspektionen) containing all transactions of shares and options in Swedish firms made by people discharging managerial responsibilities or their closely related. Share prices, applied in variables for robustness tests, are obtained from Swedish House of Finance's database FinBas. The process of collecting data on option values held by each CEO was initiated, although ended after analysing approximately 30 firms' annual reports as a majority of the firms reported insufficient data on the options for a conducting a Black-Scholes valuation. For a more detailed implications of what this lack of data entails, see Exhibit 1.

Data on ownership concentration and share of independent directors (tested in robustness tests, see section 8.8.4) is obtained from the organisation Modular Finance AB that registers ownership data on Swedish listed firms. As delisted firms are not included in the data from Modular Finance AB, we once again use the annual editions of "Owners and Power in Sweden's Listed Companies" (Ägarna och Makten) (Sundin & Sundqvist, 2001-2015) to complement the data on ownership concentration for delisted firms.

In total, the sample data used for analysis amounts to 3,538 observations.

7. Descriptive Statistics and Results

7.1 Descriptive Statistics

This section contains descriptive statistics for our sample and for specific variables. Examining Table 13 and 14 in Appendix, presenting descriptive statistics of our sample, the observations are evenly distributed over the years. Focusing on the distribution between industries, the industrials, financials and technology sectors are the most common sectors. In total, the sample contains 82 retirements, evenly distributed over the years, but somewhat skewed towards companies in the industrials sector.

The descriptive statistics for our variables included in regression model 1-4 are reported in Table 15 in Appendix. Focusing on our dependent variable, the ratio of net capital expenditures to last year's PPE, has for our sample a mean of 0.94.

In Graph 1 in Appendix, the result from our investigation of the average development of net capital expenditures for firms in our sample that have a CEO retirement in our sample years is reported. From this figure, it is discernible that average net capital expenditures decrease the full year prior to retirement (year -1). This result gives us a first indication of how net capital expenditures develops for firms with retiring CEOs.

Moreover, focusing on CEO specific variables (see Table 15 in Appendix), the CEOs in our sample own on average 1.99% of the companies they work in. Comparing this mean to the one presented in Silberzahn and Arregle's (2019) study (4.47%), we can conclude that our sample indicates that there is a lower level of firm ownership for CEOs in Swedish listed firms than in their US counterpart. However, as Silberzahn and Arregle's (2019) study only includes CEOs that are close to retirement, we also calculate the mean of the percentage of ownership for our retiring CEOs which is lower than for the entire sample (0.62%). The mean education level of the CEOs in our sample is 3.64, which indicates that the CEOs on average have an education level between a graduate degree (3) and a postgraduate degree (4). The average tenure for our sample CEOs is 5.11 years, although as discernible, with a large standard deviation indicating that there is a sizeable spread in this variable. Comparing this mean to the descriptive statistics of both Matta and Beamish (2008) (9.1 years) and Oh et al. (2016) (8.0 years), both employing datasets for all CEOs regardless of age, our sample CEOs have on average a much lower tenure than the two mentioned studies.

Focusing on the firm specific variables (see Table 15 in Appendix), the return on assets is on average 2.04% in our sample firms and the average size in number of employees is 4,965. Additionally, concerning the ownership concentration by the three largest owners, our sample exhibit a mean of ownership concentration of 46.10% and a standard deviation of 20.10%. This entails that the three largest shareholders on average do not hold over 50% of the votes in our sample firms. However, the large spread in the standard deviation implies that this ratio differs greatly between firms.

Additionally, in our dataset, out of the 82 retirement observations, 43 retirement observations are made in companies that are part of a sphere. In turn, in 31 retirement observations the CEOs that retire fulfil the criteria developed for our variable 'social identification to sphere'.

Furthermore, turning the attention to the correlations between the continuous variables, we perform a Pearson's correlation test reported in Table 16 in Appendix. Discernible from these results is that firm age and size seem to be correlated with the size of CEO compensation. Furthermore, a negative correlation between Tobin's Q and leverage is noticeable. An interpretation of this correlation suggests that a higher level of leverage decreases the market value of assets in relation to the book value of assets.

7.2 Results

This section will present the results from our regression models and will focus on our multivariate regressions testing our posed hypotheses in section 6.3. Moreover, in the following sections, the discussion of our results will primarily be based on the regression models with two-way fixed effects, while still presenting the results from the four-way fixed effects regressions models in the respective regression tables. This decision is mainly based on the notion that fixed effects often lead to a lack of significant results due to the low variability in the variables controlled for through fixed effects (Hill et al., 2019). Furthermore, the effects of introducing additional fixed effects are ambiguous (Andrews et al., 2006) and the convention of previous research has been to control for only year and industry fixed effects (see section 6.2.4). In what manner the results are connected to the theories and their predictions underlying the study will be discussed in the Discussion, section 8. The results from the multivariate regressions are in turn validated through several robustness tests presented in section 8.8.

7.2.1 Hypothesis 1

Our first hypothesis, whether the CEO horizon problem is prevalent in Sweden, is tested through regression model 1 and 2 and the results for these are presented in Table 17 in Appendix and Table 18. For regression model 1, we start by examining the univariate relationship between net capital expenditures ($CAPEX$) and CEO retirement ($retire$), resulting in a negative coefficient for CEO retirement at the 1% significance level. Further, for both regression model 1 and 2, we run a multivariate regression on $CAPEX$ against the indicator variable $retire$ and a set of control variables. As discernible from Table 17 in Appendix and Table 18 including the results from regression model 1 and 2, the coefficient for $retire$ is significantly negative at the 1% level in both regressions with two-way fixed effects, leading to us to reject the null hypothesis stating that the coefficient for $retire$ is equal to zero. The negative sign of the coefficient for $retire$ in turn implies that our sample of CEOs in Swedish listed firms decrease net capital expenditures prior to their retirement. An interpretation of these results is that retiring CEOs act opportunistically and that the CEO horizon problem is prevalent in a Swedish setting. Our results are in line with several previous studies, for example Dechow and Sloan (1991), Matta and Beamish (2008) and Abernethy et al. (2019). Furthermore, the result is, compared to existing studies outside of the US, in line Fang et al. (2018) but contradicting to Conyon and Florou's (2006) results.

Furthermore, we also run both regression model 1 and 2 controlling for firm and CEO-fixed effects. The sign of the coefficient for the variable on retirement remains negative in the four-way fixed effects models, although no longer significant. The enhanced accuracy induced by controlling for four-way fixed effects is evident when reviewing the R-squared value. For example, in regression model 2, the R-squared adjusted increases from 0.16 to 0.45 when going from two-way to four-way fixed effects. Further comparing the differences due to the introduction of additional fixed effects, some other differences are discernible. These differences can either be a result of the further introduced fixed effects affecting the coefficients of control variables or the number of observations in the regression. For example, in regression model 2 the coefficients for control variables; CEO STI, equity ownership, firm age, firm previous performance and firm leverage changes sign between the two versions of the regression model.

Further studying the results from both our first regression model 1 and 2 in Table 17 in Appendix and Table 18, the coefficient on the percentage of shares owned by the CEO is negative and significant in our two-way fixed effects regression. This result indicates that the higher the ownership stake the CEO has in the firm, the lower the net capital expenditures. However, the results from the four-way fixed effects model shows a positive, although not significant, coefficient for CEO ownership, why the interpretation of this variable should be made with caution. Moreover, it is also discernible that a higher firm age is associated with lower investment levels, as we predicted in our passage on control variables in section 6.2.3, significant on a 5% level in the two-way fixed effects regression model. Also, the coefficient for previous firm size is negative and significant on a 1% level.

In regression model 2, we add two additional control variables. Our added variables on earnings-based incentives and relay process both exhibit positive relation to net capital expenditures, although without significance. The variable for relay process shows the effect that CEO retirement conducted through a relay process has on net capital expenditures. The positive coefficient of the variable of relay process is in line with our predictions, although the interpretation should be made with caution given its lack of significance. Furthermore, we wish to highlight the changes in the variable for CEO retirement between regression model 1 and 2 with two-way fixed effects. First, the coefficient is slightly more negative in regression model 2 (-0.27) compared to regression model 1 (-0.24). Second, the significance level of the negative coefficient of CEO retirement decreases in regression model 2.

Table 18. Regression Model 2

	Regression Model 2 FE	Regression Model 2 FE four-way
retire	-0.269***	-0.0856
	(-2.59)	(-1.05)
CEOsalary	0.199	0.00978
	(0.18)	(0.01)
CEOSTI	0.0635	-0.00759
	(0.53)	(-0.06)
CEOoption	0.129	0.232

	(1.20)	(1.23)
CEOshares	-0.838*	0.0521
	(-1.73)	(0.08)
CEOLTI	-0.139	-0.0535
	(-0.40)	(-0.14)
CEOedu	0.0484*	
	(1.40)	
CEOtenure	0.165	0.249
	(0.11)	(0.14)
firmage	-0.114**	0.422
	(-1.79)	(1.23)
ROA	-0.885	0.910
	(-0.48)	(0.47)
size	-0.181***	-0.257*
	(-3.52)	(-1.94)
leverage	0.162	-0.727
	(0.10)	(-0.43)
FCF	-0.00888	-0.0220
	(-0.26)	(-0.49)
TobinsQ	0.0478	0.0245
	(1.27)	(0.41)
relay	0.233	0.359
	(0.96)	(0.86)
earnbased	0.0430	-0.0636
	(0.41)	(-0.26)
IMR	0.459	0.162
	(0.15)	(0.05)
Constant	-0.791	-1.174
	(-0.07)	(-0.09)
Industry FE	Yes	Yes
Year FE	Yes	Yes
CEO FE	No	Yes
Firm FE	No	Yes
Adjusted R^2	0.155	0.448
Degrees of freedom	17	16
Observations	3464	3258

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table presents the regression results from regression model 2, testing hypothesis 1. The first column from the left presents the variables. Regression model 2 adds the indicator variables for relay processes and earnings based short-term incentives. The second column to the left presents results from the multivariate regression testing retirement on net capital expenditures and controlling for fixed effects for year and industry. The third column to the left presents the results from our four-way fixed effects regression model 1. As differences in CEO education is controlled for through CEO fixed effects, this variable is omitted. Variable description: $CAPEX$ = net capital expenditures over PPE, $retire$ = 1 for last full year prior to CEO retirement, $CEOsalary$ = natural logarithm of CEO base salary, $CEOSTI$ = natural logarithm of CEO STI, $CEOoption$ = 1 if CEO hold firm options, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = natural logarithm of CEO LTI, $CEOedu$ = takes on value 0-5 depending on education level, $CEOtenure$ = natural logarithm of number of years that the CEO has been in position, $firmage$ = natural logarithm of number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = lagged natural

logarithm of number of employees, $leverage$= lagged leverage ratio, FCF = lagged natural logarithm free cash flow, $TobinsQ$ = lagged Tobin's Q, IMR = Inverse Mills ratio from first-stage probit regression model, $relay$ = 1 if turnover is conducted through a relay process, $earnbased$ = 1 if CEO STI is based on earnings-based results. Significance levels are based on a one-sided t-test, except for variables $CEOsalary$, $CEOoption$, $CEOshares$, $CEOLTI$, $size$ and IMR.

7.2.2 Hypothesis 2

The third multivariate regression, regression model 3, tests our second hypothesis, if higher ownership concentration is associated with decreases in net capital expenditures by retiring CEOs, through the added interaction term ($ownercon \times retire$). Focusing on the results for the interaction term (see Table 19), we are able to reject the null hypothesis for hypothesis two since the coefficient for the interaction term is significantly positive at a 1% level. This implies that higher corporate governance control in form of higher firm ownership concentration mitigates decreases in net capital expenditures by retiring CEOs. Examining the result of the four-way fixed effects regression, the coefficient for the interaction term ($ownercon \times retire$) remains positive, although loses significance.

Comparing the results of the coefficients for the control variables in regression model 3 to regression model 2, the signs on all control variable coefficients remain the same. Also, except for the variable for CEO equity holdings, the same variables that are significant on a 10% level or less in regression model 2 remain significant in regression model 3.

Even though the effect of ownership concentration on retiring CEOs has not been investigated in previous literature on the CEO horizon problem, we wish to address the results by previous research including variables on ownership structures. Oh et al. (2016) find no significant relationship between the interaction term on blockholder ownership and CEO age and their dependent variable. Furthermore, Fang et al. (2018) include a control variable on the share of the firm owned by the largest shareholder, although not interacted with the independent variable for CEO retirement. Fang et al. (2018) find a positive, although not significant, relationship between the control variable and the dependent variable in their fixed effects models. While our results are not directly comparable to previous research, our positive and significant findings stand out.

7.2.3 Hypothesis 3

Our last main multivariate regression, regression model 4, tests hypothesis 3 – if retiring CEOs' potential social identification towards Swedish business spheres is correlated with decreases in net capital expenditures. The results from regression model 4 can be seen in Table 19 and shows a positive coefficient, significant at the 1% level, for the interaction term for retiring CEOs that exhibit certain social identification characteristics to the sphere. This result indicates that CEOs that socially identifies with their sphere are less inclined to decrease net capital expenditure prior to retirement. Focusing on the control variables in regression model 4, their results are similar to the results of regression model 3, again with the exception for CEO salary which once again changes signs.

Comparing the results of the coefficients for the control variables in regression model 4 to regression model 2, the signs on all control variable coefficients remain the same. Also, the variables that are significant on a 10% level or less in regression model 2 remain significant in regression model 4.

Although the effect of a 'social identification to sphere' on retiring CEOs has not been investigated in previous literature on the CEO horizon problem, we wish to address the results by previous research including variables on social and organisational identification. Abernethy et al. (2019) find that organisational identification mitigates the pre-retirement decreases in R&D expenditures and CSR ratings. Silberzahn and Arregle (2019) find that social identification mitigates the pre-retirement decreases in capital expenditures. Our results are in line with the findings in previous literature and add to the notion that CEO identity plays a role in pre-retirement opportunism.

Table 19. Regression Model 3 and Regression Model 4

	Regression Model 3 FE	Regression Model 3 FE four-way	Regression Model 4 FE	Regression Model 4 FE four-way
retire	-0.865***	-0.175	-0.442***	-0.119*
	(-2.97)	(-0.83)	(-3.53)	(-1.28)
ownercon	-0.446**	-0.593		
	(-1.70)	(-1.06)		
retire x ownercon	1.298***	0.180		
	(2.46)	(0.44)		
sphere			-0.0903	omitted
			(-0.96)	
retire x sphere			0.484***	0.0903
			(2.65)	(0.58)
CEOsalary	0.303	-0.0432	0.131	-0.0222
	(0.28)	(-0.03)	(0.12)	(-0.02)
CEOSTI	0.0764	-0.0136	0.0568	-0.0113
	(0.64)	(-0.10)	(0.47)	(-0.08)
CEOoption	0.133	0.232	0.130	0.232
	(1.24)	(1.22)	(1.22)	(1.22)
CEOshares	-0.575	0.104	-0.838*	0.0548
	(-1.19)	(0.15)	(-1.72)	(0.08)
CEOLTI	-0.183	-0.0338	-0.113	-0.0433
	(-0.54)	(-0.09)	(-0.32)	(-0.11)
CEOedu	0.0478*		0.0471*	
	(1.37)		(1.36)	
CEOtenure	0.372	0.170	0.0548	0.200
	(0.24)	(0.09)	(0.03)	(0.11)
firmage	-0.104**	0.433	-0.108**	0.425
	(-1.68)	(1.27)	(-1.71)	(1.24)
ROA	-1.050	1.037	-0.765	0.962
	(-0.58)	(0.53)	(-0.41)	(0.49)

size	-0.171***	-0.253*	-0.180***	-0.257*
	(-3.43)	(-1.91)	(-3.47)	(-1.94)
leverage	0.337	-0.868	0.0295	-0.774
	(0.21)	(-0.51)	(0.02)	(-0.45)
FCF	-0.0132	-0.0232	-0.00752	-0.0212
	(-0.39)	(-0.50)	(-0.22)	(-0.46)
TobinsQ	0.0433	0.0181	0.0462	0.0246
	(1.14)	(0.30)	(1.23)	(0.41)
relay	0.222	0.393	0.209	0.356
	(0.91)	(0.91)	(0.84)	(0.84)
earnbased	0.0374	-0.0783	0.0422	-0.0609
	(0.36)	(-0.32)	(0.40)	(-0.25)
IMR	0.843	0.00547	0.239	0.0670
	(0.28)	(0.00)	(0.08)	(0.02)
Constant	-2.076	-0.282	0.0675	-0.817
	(-0.17)	(-0.02)	(0.01)	(-0.06)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
CEO FE	No	Yes	No	Yes
Firm FE	No	Yes	No	Yes
Adjusted R^2	0.157	0.449	0.155	0.448
Degrees of freedom	19	18	19	17
Observations	3462	3256	3464	3258

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table presents the regression results from regression model 3 and 4, testing hypothesis 2 and 3 respectively. The first column from the left presents the variables. Regression model 3 adds the continuous variable on ownership concentration as well as the interaction term between ownership concentration and CEO retirement to regression model 2. The second column to the left shows the results from the multivariate regression model 3, testing retirement on net capital expenditures and controlling for fixed effects for year and industry. The third column to the left presents the results from our regression model 3, controlling for four-way fixed effect, on industry, year, firm and CEO. As differences in CEO education is controlled for through CEO fixed effects, this variable is omitted, otherwise, the four-way fixed effects regression contains the same control variables as the two-way fixed effects regression. In the second column from the right, the results from our two-way fixed effects regression model 4 is presented, adding the indicator variable for CEOs' 'social identification to spheres' and an interaction term for CEO 'social identification to spheres' and retirement. The column to the right presents the results from our regression model 4, controlling for four-way fixed effect, on industry, year, firm and CEO. As differences in CEO education is controlled for through CEO fixed effects, this variable is omitted, otherwise, the four-way fixed effects regression contains the same control variables as does the two-way fixed effects regression. Variable description: $CAPEX$ = net capital expenditures over PPE, $retire$ = 1 for last full year prior to CEO retirement, $CEOsalary$ = natural logarithm of CEO base salary, $CEOSTI$ = natural logarithm of CEO STI, $CEOoption$ = 1 if CEO hold firm options, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = natural logarithm of CEO LTI, $CEOedu$ = takes on value 0-5 depending on education level, $CEOtenure$ = natural logarithm of number of years that the CEO has been in position, $firmage$ = natural logarithm of number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = lagged natural logarithm of number of employees, $leverage$= lagged leverage ratio, FCF = lagged natural logarithm free cash flow, $TobinsQ$ = lagged Tobin's Q, IMR = Inverse Mills ratio from first-stage probit regression model, $relay$ = 1 if turnover is conducted through a relay process, $earnbased$ = 1 if CEO STI is based on earnings-based results, $ownercon$ = percentage of voting rights belonging to the three biggest shareholders, $ownercon \times retire$ = the effect that ownership concentration has on net capital expenditures in firms with a retiring CEO, $sphere$ = 1 if the CEO exhibits social identification to a business sphere, $sphere \times retire$ = the effect that exhibiting characteristics of

social identification to a business sphere has on net capital expenditures in firms with a retiring CEO. Significance levels are based on a one-sided t-test, except for variables $CEOsalary$, $CEOoption$, $CEOshares$, $CEOLTI$, $size$ and IMR.

8. Discussion

This section contains a discussion of our results in relation to the theories and their predictions and how the methodology applied can impact the results. We wish to problematise our findings in the light of the agency theory, the prospect theory and the social identity theory. For the predictions of the agency and the prospect theory, we conduct additional tests. We also discuss the results from several robustness tests and how well our study can be extended to the population.

8.1 Evaluation of Results

8.1.1 Agency Theory

In regression model 1 and 2, we find evidence that net capital expenditures decrease in firms with retiring CEOs. These results imply pre-retirement opportunistic behaviour and the existence of the CEO horizon problem. From an agency theory perspective, market monitoring decreases as CEOs come closer to retirement as a result of less concerns of the future career. These predictions suggest that our findings of pre-retirement opportunism are enabled by Swedish retiring CEOs being less concerned about their future careers and the monitoring from the job market of managers. According to the agency theory, the opportunistic decrease in net capital expenditures constitute a residual loss. Again, from an agency theory viewpoint, our findings could also imply that retiring CEOs' short-term incentives encourage opportunistic behaviour. Furthermore, the existence of pre-retirement opportunism should also be put in the context of the effectiveness of other CEO control mechanisms.

The agency theory-based literature suggests that short-term earnings-based incentives might further encourage pre-retirement opportunism and lead CEOs to maximise these incentives through for example earnings management (Dechow & Sloan, 1991). Therefore, the decrease in net capital expenditures prior to retirement is connected to the CEO's opportunistic intent of increasing firm result and improving the firm cash flow. In turn, these actions would theoretically lead to an increase in short-term earnings-based incentives. However, our models do not fully explain if the pre-retirement decrease in net capital expenditures is related to short-term earnings-based incentives, as the variables on CEO STI and the indicator variable on earnings based STI is not interacted with the retirement variable. This will be further developed in section 8.2.1 through additional tests of theory-based predictions.

Furthermore, our findings imply that Swedish boards and shareholders are unsuccessful in mitigating the opportunistic behaviour of retiring CEOs. While we cannot specify the underlying reasons for this, we present several plausible explanations according to the agency theory. First, shareholders might not be aware of pre-retirement opportunism. Second, shareholders do not have the means necessary to impose controlling measures of the retiring CEO. Third, the agency costs of reducing the opportunistic behaviour through monitoring and bonding costs are perceived greater than the potential reduction that these measures can have on the residual loss. Fourth, despite attempts to increase controlling mechanisms intended for

retiring CEOs, shareholders and the boards are not able to fully control a retiring CEO's actions, as suggested by Marinovic and Varas (2019).

Several studies insinuate that Swedish principal-agent relations are characterised by lower agency costs than their US counterparts (Lubatkin et al., 2005; Hofstede & Hofstede, 2005). Furthermore, studies claim that the Swedish context is dominated by other theories than the agency theory, predicting less opportunism between agents and principals (Lubatkin et al., 2005; Randøy & Jenssen, 2004). However, in our study, we do find evidence indicating existence of the CEO horizon problem, implying that there nevertheless exists pre-retirement opportunistic behaviour as predicted by the agency theory. We present three plausible lines of arguments that can explain why pre-retirement opportunism might exist in a context argued to be low-opportunistic.

First, the existence of pre-retirement opportunism could imply that Swedish principal-agent relations are not characterised by as low opportunism as several authors have argued (e.g. Lubatkin et al., 2005; Hofstede & Hofstede, 2005; Randøy & Jenssen, 2004). While this argument is plausible, questioning the strong evidence from previous studies indicating lower opportunistic behaviour in a Swedish setting is not unproblematic. Second, CEOs of Swedish listed firms are more prone to act opportunistically compared to the Swedish population in general. Third, even in a setting characterised by low-opportunistic principal-agent relations, such as the Swedish, the desire to opportunistically plan for an advantageous retirement is tempting enough to change the CEO's behaviour. An interpretation is therefore that on average, CEOs of Swedish listed firms act with little opportunism, but when approaching retirement, they turn to a more opportunistic behaviour. Our third line of reasoning therefore suggests that our results confirm that the CEO horizon problem predictions hold in national contexts characterised by low opportunism. Therefore, our findings could suggest that settings of persistently low opportunism might not exist, but rather circumstances where agents choose to act opportunistically more seldomly.

In regression model 3 we focus on testing the effects of an agency theory related governance mechanism, ownership concentration. In line with our hypothesis, the result of regression model 3 implies that a higher ownership concentration has a mitigating effect on CEO pre-retirement opportunism in the Swedish context. We believe that these findings may be related to two potentially co-existing effects presented in the agency theory literature. First, a high ownership concentration in itself could lead to better control of retiring CEOs as larger owners have more power and are more motivated to control managers (Thomsen & Pedersen, 2000). Second, a high ownership concentration leads to a more effective use of other monitoring or control mechanisms and more power to enforce them (Shleifer & Vishny, 1997; Thomsen & Pedersen, 2000). Furthermore, while in an international comparison, the Swedish context of common occurrence of high ownership concentration is advantageous for an ownership-concentration analysis, we recognise that these results might not be generalisable to other countries (La Porta et al., 1998; Lubatkin et al., 2005; Schnyder, 2008).

8.1.2 Prospect Theory

To begin with, our findings of a decrease in net capital expenditures for retiring CEOs can be in line with the predictions from both the agency theory and the combined agency theory and prospect theory. While acknowledging that the prospect theory is used as an additive theory to the predictions of the agency theory in the CEO horizon problem, we aim to in this passage discuss our results from a prospect theory perspective with its related predictions.

In regression model 1 and 2, we find evidence that net capital expenditures decrease in firms with retiring CEOs. These results imply pre-retirement opportunistic behaviour and the existence of the CEO horizon problem. From a prospect theory perspective, CEOs become loss averse toward their wealth prior to retirement, leading to decisions that decrease risky firm investments. These predictions suggest that our findings of pre-retirement opportunism are a result of CEOs' intentions to decrease the riskiness of the firm, which in turn would decrease the riskiness of their firm-endowed wealth.

In our model, CEO firm-endowed wealth is captured through the variables of CEO equity ownership, the option indicator variable and potentially also the CEO long-term incentives (LTI), which tend to mainly be composed of different types of equity and/or option incentives. However, as our main regression models do not focus on capturing the effects of these variables exclusively on retiring CEOs, but rather to control for the differences between all observations, we perform additional tests, presented in section 8.2.2. In our additional tests, we let the variables on CEO equity ownership, options and LTI interact with our retirement variable, allowing us to understand how these incentives impact the retiring CEOs.

8.1.3 Social Identification Theory

Social identification leads to an alignment in behaviour between an actor and the social category to which the actor perceives that he or she belongs to (Ashforth & Mael, 1989). As described in section 6.3.3, we argue that CEOs that are employed in firms that are a part of a Swedish business sphere theoretically could exhibit social identification to this sphere. Moreover, we also claim that such a social identification could lead to a decrease in pre-retirement opportunism for CEOs working in Swedish business spheres.

Our regression model 4 shows that retiring CEOs in Sweden who fit the 'social identification to sphere' criteria, presented in section 6.2.2, decrease net capital expenditures to a lesser extent. Furthermore, given the preconception that social identification to a social category equals a behaviour in the best interest of this social category, it is possible to make several interpretations of our results from regression model 4. First, the finding that retiring CEOs who match the social identification criteria to spheres exhibit decreased opportunism prior to retirement, potentially proves the existence of social identification of CEOs to spheres in Sweden. Second, our findings also suggest that retiring CEOs who socially identify with spheres act less opportunistically and to a greater extent align their actions to shareholders' objectives. This interpretation implies that social identification can play a significant role in the alignment of principal-agent relations.

8.2 Additional Tests on Theory-Based Predictions

While our results suggest the existence of a CEO horizon problem among CEOs in Swedish listed firms, the two primarily predictive theories, the agency theory and the prospect theory, have different suggestions for the underlying reasons as to why retiring CEOs act opportunistically. In the following section we wish to examine some underlying reasons in each of the two theories, to see how their predictions hold and affect the opportunistic behaviour of retiring CEOs in our sample.

8.2.1 Agency Theory

In the following section, we aim to isolate the predictions of the CEO horizon problem based on the agency theory. The agency theory predicts that a retiring CEO will try to manage short-term earnings, generally the results in the income statement or cash flow statement, to be able to maximise short-term earnings-based incentives. To test the agency theory-based predictions we conduct four tests, based on the regression model 2, applying two-way fixed effects. The results for all four regressions can be found in Table 20 in Appendix.

First, we single out the part of net capital expenditures that affects the income statement, the depreciation. Hypothesising that opportunistic decreases in net capital expenditures should show up in the income statement in form of smaller depreciation costs and as a result, potentially increased income statement-based short-term incentives for the CEO. Using the depreciation scaled by sales as a dependent variable and including the control variables from regression model 2, we find that retirement leads to a decrease in depreciation, although not significant.

Second, to further the understanding of the opportunistic behaviour of retiring CEOs, we run a multivariate regression with an interaction term between CEO STI and CEO retirement on net capital expenditures as the dependent variable. We find that that the interaction term between CEO STI and retirement has a positive, although not significant, relation to net capital expenditures for retiring CEOs. This finding could entail that retiring CEOs do not decrease net capital expenditures as a measure to increase short-term incentives, as predicted by the agency theory.

Third, we run a test including an interaction term between retirements and the indicator variable denoting that a CEO has earnings-based short-term incentives. In contrast to the agency theory predictions, we find that retiring CEOs with earnings-based short-term incentives has a positive, although not significant, effect on net capital expenditures. The findings of the second and third test are similar to Davidson et al. (2007), who evidence the existence of the CEO horizon problem, but find weak support that pre-retirement opportunistic behaviour is accentuated by short-term earnings-based incentives.

Fourth, we run a final regression including an interaction term between CEO STI, the earnings based short-term incentives indicator variable and retirement. This regression results in a positive relationship between the CEO STI and net capital expenditures when a CEO retires, given that the CEO STI is earnings based. While highlighting the lack of significance for the results, this could indicate that earnings-based incentives make the CEO STI positively

correlate with net capital expenditures for retiring CEOs which is not in line with agency theory predictions.

In conclusion, based on the presented additional tests, the agency theory-based predictions of the effects on depreciation, CEO STI and the indicator that the CEO has earnings-based short-term incentives are not explanatory. Therefore, we cannot draw any specific conclusions that add to our previous discussions on the results based on the agency theory.

8.2.2 Prospect theory

To be able to capture the predicted effects by the prospect theory, we perform three separate tests where we let the variable on CEO equity ownership, the indicator variable on option ownership and the variable of CEO LTI interact with our independent variable for retirement. These supplementary regression models are based on regression model 2, using two-way fixed effects and the results are found in Table 21 in Appendix.

In the three regressions, the stand-alone independent variable for CEO retirement continues to be negative and significant in three out of four tests, consistent with the result of regression model 2. When interacting CEO equity ownership with the retirement variable, the coefficient is positive, although not significant. This result indicates that a higher equity ownership mitigates decreases in net capital expenditures for retiring CEOs, which is consistent with agency theory predictions but not with prospect theory predictions.

To further ascertain the robustness of the effect of equity ownership, another adjusted measure of the equity ownership variable is developed in line with Cazier (2011), scaling the value of the equity ownership (in MSEK) of a CEO to the annual salary (in MSEK). Running a regression with the adjusted variable of CEO equity ownership as an interaction with the retirement indicator variable shows a positive, albeit not significant, correlation with net capital expenditures.

Furthermore, when running a regression including an interaction term between the CEO option indicator variable and the retirement variable, the coefficient is negative, although not significant. This would be in line with the prospect theory predictions. However, the sub-optimal construction of the variable as an indicator variable, failing to capture the value of options, potentially impacts these results. This flaw entails that we are not able to accurately test the predictions of the prospect theory, given that the magnitude of option holding values has been evidenced to be important in previous studies (Matta & Beamish, 2008; Xu & Yan, 2014).

Lastly, when interacting the variable for CEO LTI with the retirement variable, the coefficient is positive and significant. That long-term incentives seemingly mitigate decreases in net capital expenditures for retiring CEOs is inconsistent with the predictions of the prospect theory. While the composition and the specific content of the long-term incentives of CEOs is partly unknown to us, these results could indicate that the predictions of the agency theory are more applicable in this case.

In conclusion, it seems like the prospect theory-based predictions of the effects of equity ownership, option ownership and long-term incentives hold little explanatory value in our supplementary regression tests. While the separate tests aiming to highlight the underlying reasons for the prospect theory predictions are inconclusive, we cannot exclude that the prospect theory predictions do not hold in our study. For example, retiring CEOs could act in risk-averse manner due to factors we do not control for in our regression.

8.3 Evaluation of Method

In this section, we discuss the capacity of our chosen measures to accurately test the CEO horizon problem in Sweden. As aforementioned in section 3, extant literature uses several different dependent variables when attempting to capture the potentially opportunistic behaviour of a retiring CEO. Furthermore, different measures capture different behaviours, which in turn are connected to the specific theories underlying the properties of the CEO horizon problem. The pre-retirement opportunistic behaviour of reducing net capital expenditures is in line with both the agency theory and the prospect theory, as such actions entail lower costs in the income statement, cash outflows and a lower level of long-term risky investments. Testing these two theories simultaneously creates difficulty in discriminating between the two types of opportunistic behaviour. Even though control variables such as CEO STI and CEO equity ownership are included, our study is not able to discern to what extent the decrease in net capital expenditures in the sample firms prior to the CEO retirements is caused by an opportunistic behaviour that could be aimed at increasing short-term incentives, versus the intent of decreasing firm risk caused by loss aversion.

8.4 Validity of Variables

8.4.1 Measuring Retirement

The measure of our independent variable retirement is sensitive to its construction, as there exists a risk that a retirement is incorrectly labelled. The incorrect labelling of a retirement that is in fact not a retirement could appear for two primary reasons. The first reason is if the CEO leaves the firm after the age of 58 and continues to work as a CEO in a firm in another country, as our dataset only includes CEOs in Swedish firms. The second reason is if the CEO unexpectedly passes away at age 58 or above.

Furthermore, we wish to discuss the application of a specific age to indicate that a CEO turnover event[10] is in fact a retirement. As previously mentioned, the specific age parameter is included as it is assumed that the older the CEO is at the point of a turnover event, the less concerned he or she is about potential future career prospects outside a CEO role. However, one could argue that the risk of incorrectly labelling retirements could increase if the CEO is younger at the turnover event, as a younger CEO is potentially more likely to assume a CEO role outside of Sweden.

[10] A turnover event indicates the last time the person is a CEO in any Swedish listed or private firm

To test the validity of our retirement variable, we run a regression based on regression model 2, using two-way fixed effects, applying the age of 63 instead of 58 as a cut-off to indicate that a CEO turnover event is a retirement. This test presents a negative correlation between retirements and net capital expenditures, at the 5% significance level (see Table 22 in Appendix). Therefore, it could be argued that the chosen age cut-off level is not determining for our results.

Second, we specifically look into ten randomly chosen turnover events classified as retirements when the CEO is aged between 58-59 to test if these turnover events are indeed retirements. This test finds that nine out of the ten classified retirements are indeed actual retirements, while one was wrongly classified as the CEO passed away (see Table 23 in Appendix).

Additionally, there could exist a variance within retirement events in terms of pre-opportunistic behaviour. One such variance could be between non-routine and routine[11] retirement events. However, it is not unproblematic to argue that CEOs with non-routine retirements are unable to foresee (and therefore opportunistically plan for) the coming retirement event, why we argue that that both routine and non-routine retirements events can be preceded by opportunistic behaviour.

Lastly, we can due to our indicator of the turnover event of a CEO, potentially miss out of turnover events that in fact could be retirements. This could be the case when a CEO retires from a listed company and assumes a role as a CEO in a small, privately held company mainly used for private purposes. In such a turnover scenario, the predictions of the CEO horizon problem would most likely still hold.[12]

8.4.2 Measuring Option Holdings

The value of CEO option holdings has been pointed out as being an impactful part of the CEO horizon problem (Xu & Yan, 2014; Silberzahn & Arregle, 2019). However, as there, to the best of our knowledge, exists no database on option holding values of CEOs in Sweden and since many annual reports do not include all necessary information needed to conduct a Black-Scholes valuation of CEO option holdings, we seek to capture the effect of option holdings through an indicator variable. Consequently, due to the absence of data, there will be that parts of the CEOs firm endowed wealth that is not entirely captured in our study. For examples of missing data needed to conduct option valuation in annual reports, see Exhibit 1 in Appendix.

8.4.3 Measuring Ownership Concentration

There are many ways to measure ownership concentration, both interaction terms and continuous variables have been employed (Short, 1994). In our study, we use a continuous

[11] A routine retirement is one where the CEO retirement is planned.

[12] For example, in 2005, Marcus Wallenberg steps down as a CEO from Investor AB, a large listed investment company, and assumes the role as CEO in the private company Vidbynäs Förvaltningsaktiebolag. Vidbynäs Förvaltningsaktiebolag is a small company that manages Marcus Wallenberg's private country house and estate. However, our definition of the turnover event of a CEO would not let us capture Marcus Wallenberg's step down from the CEO role at Investor AB in 2005. In the case of Marcus Wallenberg, he was not in a retirement age when stepping down from Investor AB, why this would not entail a proper retirement by our classification, but the example highlights a flaw of our definition of the turnover event of CEOs.

variable to capture ownership concentration. We choose this measure to avoid being bound by a specific definition of what a certain level of ownership concentration entails, as these levels vary in the literature (ibid.). Moreover, the way to measure ownership concentration also varies in terms of which owners to include, for example, measuring the shares owned by largest owner or the five largest owners. In our study, we measure the ownership concentration based on the share of votes owned by the three largest shareholders.

8.4.4 Measuring Social Identification to Spheres

Since our variable on 'social identification to spheres' is developed from research that was not originally intended to capture the social identification of CEOs, but rather directors (Hillman et al., 2008; Ashforth & Mael, 1989), there is a risk that the variable does not accurately capture the CEOs' social identification to spheres. Additionally, we want to highlight that our social identification characteristics may capture other characteristics of spheres that affect pre-retirement opportunism, such as highly clustered networks, which may be related to spheres, but not to social identification. Additionally, it has been argued that there is a risk that variables that try to assess psychological traits using public data could lack explanatory power (Abernethy et al., 2019).

Lastly, there exists a risk that our regression model 3, testing ownership concentration, and model 4, testing social identification, capture similar traits as spheres also tend to exhibit high ownership concentration. To avoid this, our variable intended to capture social identification is based on several components that can be argued to not be related to ownership concentration (for further detail, see section 6.2.2). From these results, we argue that the two models, regression model 3 and 4, adequately manages to capture separate phenomenon. Furthermore, we conduct a Variance Inflation Factor test on a regression model including both ownership concentration and sphere social identification, see section 8.6.

8.5 Sample Bias and Generalisability

A sample's representability for the population is given by the size and the extent of biases of the sample. Firstly, as mentioned in section 6.4, our sample has a selection bias towards large firms. Also, since the sample does not contain data on joint stock banks, our results might not be generalisable to firms in this category. Moreover, our sample consists of both currently listed and delisted firms, why the sample is not subject to survivorship bias.

The generalisability of our results depends on whether our results are representative of the population, which for our study consists of Swedish listed firms. Since we are able to reject the null hypothesis for all of our hypotheses, one could interpret our results as generalisable. However, as discussed in section 2 and 3, there are factors that are specific for individual countries, such as corporate governance regulations, laws and norms which make an extension of our results to firms in countries other than Sweden problematic. We do not believe that the time period in which our study is conducted has a considerable impact on the generalisability of our results. Further, since our study also controls for year fixed effects, specific time-related impacts such as economic cycles should not affect the extension of our results over time.

Our findings using net capital expenditures should be generalisable to the CEO horizon problem in general as the problem as such is not restricted to testing whether retiring CEOs act opportunistically through a certain variable, but rather any opportunistic behaviour prior to retirement. In other words, our results could potentially be generalisable to any opportunistic action that a retiring CEO might have discretion over and that might benefit him or her.

8.6 Multicollinearity

To determine the multicollinearity and the stability of regression model 2, the model upon which all consecutive regression models are based, we conduct a Variance Inflation Factor (VIF) test (see Table 24 in Appendix). Multicollinearity appears when there is a high degree of linear correlation between two independent or control variables, where a level of 1 indicates no multicollinearity (Hair, Anderson, Tatham & Black, 1995). Although it does not affect the predictive power of the regression model, high multicollinearity (a high VIF level) can impact the standard errors for independent variable regression coefficients, making the size of the coefficients less reliable. What is considered an acceptable maximum level of VIF is debated by scholars, with some arguing that ten is the maximum recommended level (Hair et al., 1995; Kennedy, 1992; Marquardt, 1970) while others insist on a more conservative level of five (Rogerson, 2001).

As discernible from Table 24, regression model 2 receives low values for all included variables. The level of VIF imply that a percentage of the variance of these variables are explained by other variables (Hair et al., 1995). For example, a VIF level of 2.11 for CEO salary implies that about 53% of the variance in the variable on CEO salary is explained by other variables included in the model. Focusing on our main independent variable, ($retire$), its VIF is 1.07, which implies little multicollinearity (Hair et al., 1995).

Furthermore, we perform a second VIF test including the variables on ownership concentration and sphere identification (not as interaction terms) based on regression model 2, see Table 25. In this test, ownership concentration exhibits a VIF level of 1.19 and sphere identification a VIF level of 1.29, indicating acceptable levels of multicollinearity for both variables.

8.7 Heteroscedasticity

Another risk that could question the significance of our regressions is if the variance between error terms is non-constant, that is that heteroscedasticity is present in our sample. Therefore, we conduct a Breusch-Pagan/Cook-Weisberg test to examine the variance of error terms in our sample. The test applies a null hypothesis that the sample is homoscedastic with constant variance between error terms and an alternative hypothesis that the sample is heteroscedastic. A heteroscedastic sample would imply that the error terms have a variance that differs between observations. The output of the Breusch-Pagan/Cook-Weisberg test leads us to being able to reject the null-hypothesis for all four of our regression models (see Exhibit 2). This provides evidence of the existence of heteroscedasticity for our standard errors. To adjust for our evidenced heteroscedasticity, we consistently use clustered standard errors on firm identifiers in all regression models.

8.8 Robustness Tests

8.8.1 Horizon Period

Acknowledging the problems raised by Cazier (2011), stating that the conflicting results in extant literature might be caused by the fact that most studies assume that a curtailment in firm investments *"is only a problem in the last one or two years of the CEO's tenure"*, we conduct two robustness tests employing a three-year and a five-year horizon period instead of an indicator variable for the last full year before retirement. Including these variables one at a time into our regression model 2, using two-way fixed effects, we receive similar results as in our original regression model 2 (see Table 22 in Appendix). In both the three-year and the five-year horizon period, the coefficient for the independent variable remains negative and significant on a 1% and a 5% level respectively. This further suggests that retiring CEOs start to behave opportunistically by decreasing net capital expenditures several years prior to the retirement year.

8.8.2 R&D Expenditures as the Dependent Variable

Many studies in the CEO horizon problem research field have conducted regressions using R&D expenditures as their dependent variable (e.g. Dechow & Sloan, 1991; Conyon & Florou, 2006; Abernethy et al., 2019). To ensure the robustness of our findings for the variable on net capital expenditures and its generalisability of indicating a general existence of a CEO horizon problem, we conduct a robustness test using R&D expenditures as the dependent variable. The variable on R&D expenditures is scaled by sales (as done by for example Dechow and Sloan (1991) and Cazier (2011)) and tested against the retirement variable and our set of control variables from regression model 2, using two-way fixed effects. Although tested on a smaller sample since the number of firms with R&D expenditures are fewer than those with net capital expenditures, the result from this regression indeed shows a negative, albeit not significant, relationship between R&D expenditures and CEO retirement in Sweden (see Table 22 in Appendix). Our test using R&D expenditures as the dependent variable thus provides limited robustness of our main regression models using net capital expenditures as the dependent variable.

8.8.3 Age as a Confounding Variable

To further assess the robustness of our findings, we wish to examine the effects of CEO age on net capital expenditures, as CEO age has been found to be explanative in terms of CEO behaviour (Barker & Mueller, 2002; Yim, 2013). For example, researcher Cazier (2011) has argued that the age of CEOs may be related to the intensity of firm investments, as older CEOs tend to invest less than younger CEOs. To test this, we add CEO age as a control variable to regression model 2, using two-way fixed effects (see Table 22 in Appendix). The results of the regression still demonstrate a negative correlation between retirements and net capital expenditures, significant on a 5% level. Furthermore, the control variable of age is negatively correlated with net capital expenditures and significant at the 5% level. However, it is not unproblematic to interpret if these results provide additional robustness or lack of robustness to our main regression models as it is difficult to single out the effects from age and retirements

given that they both are related. For example, a CEO of high age may prepare for retirement. The negative and significant sign of the variable for CEO age could also suggest that among listed companies in Sweden, older CEOs engage in less capital expenditures than their younger counterpart. However, it could also suggest that younger CEOs are hired in more capital expenditure-intensive firms compared older CEOs.

8.8.4 Independent Directors' Impact on Retiring CEOs

In regression model 1, we follow the study by Silberzahn and Arregle (2019). However, as discernible in Table 10 in Appendix we do not include a variable for the proportion of independent directors on the board in our regression as done by Silberzahn and Arregle (2019). Independent directors are board directors that are defined as being independent to the owners of the firm. It is predicted that the higher the proportion of independent directors, the less opportunistic behaviour of CEOs prior to retirement. This relationship has been evidenced in for example the study of Cassell et al. (2013). The reason for excluding this variable from the regression is due to lack of data on independent directors in Swedish annual reports prior to the release of the Swedish Code of Corporate Governance in 2008. However, the findings of the effects from board independence in previous literature are inconclusive. While some studies find that the degree of independent directors positively impacts firm performance (Cotter, Shivdasani & Zenner, 1997) others find that it negatively impacts firm performance (Subrahmanyam, Rangan & Rosenstein 1997). While we lack data for all of our observations, we run a multivariate regression to test the effects of independent directors on the firms that we do have data for, which is data ranging back from 2008 for the currently listed firms[13]. This entails that this test is subject to survivorship bias. For the regression, we construct an indicator variable that indicates if a firm has a larger proportion of independent directors than the median proportion of independent directors in the industry of the firm a given year.

The regression including the indicator variable of a larger proportion of independent directors on the board than median proportion of independent directors of the industry of the firm a given year includes the same variables as in regression model 2, using two-way fixed effects. Running the regression using the indicator variable of independent directors as a control variable exhibits the same significant and negative effect for retirements on net capital expenditures, and a positive, albeit not significant effect of the indicator variable of independent directors on net capital expenditures. Furthermore, interacting the variable on independent directors with the variable for retirement, we obtain a positive, although not significant, relationship between the interaction term and net capital expenditures. This indicates that if a board has higher proportion of independent directors than the industry median, the retiring CEO will potentially act less opportunistically. See Table 26 in Appendix for a tabulation of the results.

8.8.5 Industry Sub-Sample Robustness Test

Given the somewhat high mean of net capital expenditures over PPE (see Table 15 in Appendix), which we assume to be related to industries with large net capital expenditures in relation to their PPE, we make an industry subsample test. Using the industry defined as

[13] Retrieved from the Modular Finance AB's database.

'industrials' by NASDAQ OMX, we conduct a regression based on regression model 2, controlling for fixed effects for year (not industry). The mean of the net capital expenditures over PPE in this subsample is 0.58. The results indicate that retirement has a negative, albeit not significant, effect on net capital expenditures providing limited robustness to our main results (see Table 26 in Appendix). The low significance is most likely due to the vastly reduced sample size of merely 933 observations.

8.8.6 Over- and Under-Investment Robustness Test

There could exist a bias in our results due to the fact that firms have different investment opportunities and capture these opportunities to varying degrees. Several researchers have studied the effects of the relation between firm investments and cash flow, cash and cash equivalents and investment opportunities (e.g. Hubbard, 1998; Richardson, 2004). To capture the investment opportunities, Tobin's Q has been widely used, where a Tobin's Q over 1 signals investment growth or investment opportunities (Gordon & Myers, 1998).

To test whether there is a difference between firms that over- and firms that under-invest, we run two regressions based on regression model 2, using two-way fixed effects, presented in Table 26 in Appendix. In the first regression, we run the regression with firms which have a Tobin's Q above 1 and cash and cash equivalents on the balance sheet scaled to assets larger than the industry average that year. This subsample should contain firms that have investment opportunities but are not spending as much cash on cash expenditures as the industry average, signalling that a firm is underinvesting. In the second regression, we once again investigate firms with investment opportunities (Tobin's Q above 1), but this time only if the firm's cash and cash equivalents on the balance sheet scaled to assets is lower than the industry average that year. This would capture a firm that is over-investing. The regression on under-investing firms show a negative, although not significant, coefficient for retirement using net capital expenditures as the dependent variable. Moreover, the regression on over-investing firms show a positive, although not significant, coefficient for retirement using net capital expenditures as the dependent variable. While these results are not significant, they could entail that under-investing firms have a larger problem with pre-retirement CEO opportunism. However, the tests do provide limited robustness to our main regression models.

9. Concluding Remarks, Limitations and Suggestions for Future Research

This study has investigated if the CEO horizon problem is prevalent in Sweden. Specifically, we have examined the effect that CEO retirement has on firm net capital expenditures in Swedish listed firms. The main finding is that net capital expenditures on average decrease in the year prior to a CEO retirement. This result indicates that CEOs of Swedish listed firms act opportunistically prior to their retirement. An interpretation of our results suggests that the CEO horizon problem is prevalent in a Swedish setting. Our findings imply that pre-retirement opportunism and the CEO horizon problem can exist in what has been argued to be a seemingly low-opportunistic context. Even though all of our regression models show a negative relationship between CEO retirement and firm net capital expenditures, the additional tests for several control variables connected to the predicting theories show inconsistent results, why a theoretical interpretation of our results should be conducted with care.

Additionally, this study examines the effect of ownership concentration on CEO retirement and reveals that ownership concentration has a mitigating effect on CEO pre-retirement opportunistic behaviour. An interpretation of these results indicates that high ownership concentration is an effective control mechanism to mitigate the CEO horizon problem.

This study further investigates whether characteristics and social identities particular to CEOs in Swedish listed firms have a mitigating effect on the CEO horizon problem. More specifically, the study focuses on whether CEO social identification to a Swedish business sphere could have a mitigating influence on pre-retirement opportunistic behaviour. First, this study finds that CEOs in Sweden potentially can exhibit social identification to the sphere to which their firm belong. Additionally, our results show that CEOs that display certain social identification characteristics to a sphere behave less opportunistically prior to retirement. These findings highlight the importance of understanding how certain social characteristics of a retiring CEO might impact the CEO horizon problem.

This study is delimited in scope to Swedish listed firms on the Stockholm Stock Exchange in the segments Large Cap, Mid Cap and Small Cap and ‘A-listan’ and ‘O-listan’, in the period 2001-2017. Delimiting our study to investigating our research questions in one national context enables us to hold corporate governance regulation and legal factors constant. These factors, together with national norms and culture, are according to the applied theories believed to influence the extent to which a CEO would act opportunistically. Furthermore, the length of the time period is chosen as the number of CEO retirements will impact the significance of our results, incorporating as many years as deemed possible to collect data for in the scope of this study. Additionally, we delimit our study by focusing on estimating the effects of CEO retirement on net capital expenditures. Therefore, the study does not present an evaluation of all actions that a CEO can take when acting opportunistically prior to retirement. This study is further delimited by the chosen method to investigate our posed research questions. As we examine potential pre-retirement opportunism, we are not able to draw conclusions regarding

the opportunistic behaviour of CEOs in Swedish listed firms in general. The aim of this study is not to provide solutions for how to eliminate pre-retirement opportunistic behaviour. Moreover, we do not attempt to provide recommendations on optimal governance structures. Rather, the purpose is to help shareholders and company boards through extending the understanding of CEO pre-retirement opportunistic behaviour and how different governance control mechanisms and CEO social identification can impact the CEO horizon problem.

We have several suggestions for future research that are beyond the scope of this study. In this study, we aim to contextualise the CEO horizon problem. Therefore, we believe that an alluring venue for future research would be to perform a similar study to the one conducted in this paper, although studying several national contexts simultaneously to be able to directly compare the impact on national contexts on pre-retirement opportunism. To further assess the predictability of the theories, we believe that it would be contributing to perform a qualitative study of retiring CEOs to understand the underlying motivation behind pre-retirement behaviour. Furthermore, as we find mitigating effects of ownership concentration, we encourage additional tests on the CEO horizon problem to control for the yet untested corporate governance variables, creating a better understanding of how to mitigate pre-retirement opportunistic behaviour for both researchers and practitioners. Moreover, future research should aim to further the investigation on how social identification to other social categories might influence a retiring CEO's behaviour. Through incorporating insights from further literature on social identification, future research might deepen the understanding of within-individual variances of opportunistic behaviour in research on the CEO horizon problem.

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11. Appendix

Table 1. Main Theories and Their Predictions for the CEO Horizon Problem

Theory	Based on	Main points	Predictions for the CEO horizon problem
Agency Theory	Economic theory assuming rational, self-serving and value-maximizing behaviour for both agents and principals. Separation of ownership and control in a firm.	Agents (CEOs) and principals (shareholders), aim to maximise personal gains. Due to information asymmetry, agents can act in opportunistic ways. Principals construct control mechanisms to manage the alignment between an agent's actions and a principal's desires, leading to agency costs. Control mechanisms can both come directly from shareholders (monitoring and bonding activities) and from external mechanisms (market control).	Due to a lack of career concerns for retiring CEOs, there is a decrease in market control mechanisms, why retiring CEOs attempt to maximise their short-term personal gains, at the expense of long-term commitments for shareholders. Such personal gains mainly relate to economic compensation that can be maximised through short-term earnings-based compensation plans (e.g. bonus). By decreasing discretionary spending or engaging in earnings management, a CEO can maximise his or her short-term compensation. The opportunistic behaviour can be minimised through contractual control or other controlling governance mechanism, motivating CEOs to act more long-term, in line with shareholders' desires, e.g. equity incentives.
Prospect Theory	Behavioural theory of how individuals make decisions under risk.	Individuals underweight uncertain outcomes to those achieved with confidence. Individuals are risk averse and evaluate potential gains from their current level of wealth.	Complements the agency-theory based predictions of retiring CEOs, specifically through the notion that risk aversion increases as CEOs approach retirement, predicted to be due to two behaviours: CEOs with a large portion of their own wealth invested in the firm (e.g. equity and option holdings), will aim to protect this wealth by preferring certain outcomes and avoiding riskier projects, such as long-term investment. This behaviour is specifically relevant for retiring CEOs who will not be able to reap the benefits of long-term commitments. CEOs will try to conserve their legacy, which is perceived to be large before retirement, and thus avoid projects which risks hurting the legacy.
Social Identity Theory	Combining economic theory with psychology.	Organisational outcomes depend on top managers' social identities, the strength of the identities, and which social categories they belong to.	Predicts that variations in the opportunistic behaviour of retiring CEOs given a similar set of governance mechanisms could be understood and explained by understanding the social identities of CEOs.

Table 2. Empirical Articles on the CEO Horizon Problem Based on Agency Theory

Author	Theory	Data	Method	Hypothesis and predictions	Conclusion
Butler & Newman (1989)	Agency Theory	54 CEO departures including non-	Univariate regression	Hypothesising that control mechanisms are weaker close to retirement, argues that earnings-based compensation incentivises	Find no significant effects. Argues that some control mechanisms remain effective in

		retirements, in R&D intensive industries (US)		retiring CEOs to reduce R&D, CAPEX and production levels.	preventing pre-retirement opportunistic behaviour.
Dechow & Sloan (1991)	Agency Theory	58 CEO departures including non-retirements (US)	OLS regression	Argue that earnings-based compensation incentivices retiring CEOs to focus on short-term performance, and reduce R&D, CAPEX and advertising spend.	Find evidence of decreases in R&D in pre-retirement years. CEO stock and option ownership and relay process mitigate the reductions of R&D.
Gibbons & Murphy (1992)	Agency Theory-based	1631 CEO departures from 916 firms (US)	OLS regression	Compare the effect and interplay of career concerns and contractual compensation incentives on CEOs with different career horizons.	Find that career concerns diminish as CEOs approach retirement but is mitigated by contracts.
Murphy & Zimmerman (1993)	Agency Theory-based	Panel data of 1063 CEO departures from 599 firms (US)	OLS and 2SLS regression	Argue that there are other effects that lead to decreases in firm investments for retiring CEOs. Look at the effects on R&D, advertising, capital expenditures and accounting accruals for retiring CEOs.	Find no evidence of decreases in discretionary spending for retiring CEOs, but instead that lower discretionary spending relates to weaker firm performance and non-routine CEO retirements.
Cheng (2004)	Agency Theory	Panel data of CEOs in 160 firms, 102 CEO turnover events, in R&D intensive industries (US)	OLS regression	Investigates how CEO compensation changes as CEOs approach retirement and face a small earnings decline. Tests the association between R&D spending and compensation, when the horizon and/or myopia problems are present.	Finds no evidence of decreases in R&D spending for retiring CEOs. Results also indicate that compensation committees respond and mitigate opportunistic reductions in R&D spending.
Conyon & Florou (2006)	Agency Theory	Panel Data of 90 retirements from 460 firms (UK)	Generalised Method of Moments Regression	Predict that retiring CEOs will decrease R&D and capital expenditures.	Find no evidence of decreases in R&D and capital expenditures. Evidence important governance effects for retiring CEOs.
Davidson, Xie, Xu & Ning (2007)	Agency Theory	Panel data of 597 CEO turnovers (US)	Univariate and multivariate test	Hypothesise that CEOs will manage earnings prior to retirement, especially for CEOs whose earnings-based bonus is a large portion of total compensation.	Find evidence that retiring CEOs engage in large discretionary accruals. Find weak support that earnings-based bonuses accentuate this.
Kalyta (2009)	Agency Theory-based	Panel data of 388 CEO retirements (US)	Two separate OLS regressions and univariate analysis.	Hypothesises that retiring CEOs' discretionary accounting choices are contingent on managerial compensation. Specifically, CEOs with pensions depending on firm performance will engage in income-increasing accounting choices.	Finds evidence that retiring CEOs with earnings-based pensions engage in income increasing earnings management, but finds no general evidence that retiring CEOs engage in discretionary accruals.

Cazier (2011)	Agency Theory-based	Panel data of 203 CEO retirements (US)	OLS regression (linear multivariate model), Probit regression	Argues that previous articles that find evidence of a CEO horizon problem is related to flaws in the research design (no panel data, survivorship bias etc.). Hypothesises that there will be no R&D curtailment for retiring CEOs.	Finds evidence of the hypothesis that retiring CEOs does not curtail R&D, given the application of a more thorough research design.
Kang (2016)	Agency Theory & Stake-holder Theory	Panel data of 579 firms 1992-2006 (US)	Simultaneous regression approach, firm- and random-effects models.	Investigates the effects on CSR firm commitment of retiring CEOs, given two predictions (1) that retiring CEOs try to boost short-term performance or (2) care about what legacy they leave behind.	Finds that CEO retirement has a negative effect on firm commitment to CSR. Further suggests that retiring CEOs who face weaker pressure from the market for managers may pay more attention to preserving their legacy and maintain a higher CSR commitment.
Oh, Chang & Cheng (2016)	Agency Theory-based	Panel data of 233 firms 2004-2009 (US)	Multi-level regression analyses.	Predict that as CEOs get older and their career horizon shorten, they disengage in CSR.	Find no support for the negative effects of CEO age on CSR. However, by adding interaction terms of industry-level discretion and block ownership, the authors show that CEO age has a significant negative impact on CSR ratings.
Fang, He & Conyon (2018)	Agency Theory	Panel data of 1278 firms 2003-2011 (China)	OLS regression and fixed effects estimates	Hypothesise that retiring CEOs will increase managerial slack, as CEOs are evaluated from their firm's near-term performance. Further predicts that CEO equity ownership will mitigate this effect.	Find support that managerial slack and operational inefficiency increase the last years of a CEO tenure.
Chen, Ni & Zhang (2018)	Agency Theory-based	Panel data of 2023 turnover observations (973 retirement turnovers) (US)	Cross-sectional regression. Basu regression, and model developed by Ball and Shivakumar (2005)	Investigate if retiring CEOs become less conservative in their financial reporting, which captures both accrual and real earnings management, and if corporate governance mitigates this.	Find that retiring CEOs report significantly less conservative accounting earnings before retirement than non-retiring CEOs, and that corporate governance mitigates these effects.

Table 3. Empirical Articles Based on the CEO Horizon Problem and CEO Characteristics Based on the Agency Theory

Author	Theory	Data	Method	Hypothesis and predictions	Conclusion

Barker & Mueller (2002)	Agency Theory-based	CEOs of 172 firms between 1989-1990 (US)	OLS regression	Hypothesise that a firm's R&D intensity relative to its industry peers will vary significantly with its CEO's characteristics.	While not directly testing a CEO horizon problem, two interesting findings stand out in this context. First, the strongest CEO attribute is age, having a negative effect on R&D, being a far stronger attribute than e.g. CEO tenure. Secondly, R&D spending increases with CEO shareholding, consistent with agency theory.
Yim (2013)	Agency Theory	Panel data of CEOs at firms between 1992-2007 (US)	OLS regression	Examines the relationship between CEO age and acquisitions, and compensation benefits that result from acquisitions.	Finds that CEOs curtail large acquisitions with increasing age, which is further accentuated when the CEOs can anticipate or influence high compensations related to the acquisitions.
Heyden, Reimer & Van Doorn (2017)	Agency Theory	Panel data of 100 manufacturing firms between 1998-2008 (US)	Generalized estimating equations approach	Argue that inconsistencies in previous results on the CEO horizon problem, are due to that decisions to invest or not invest in R&D is not solely on the shoulders of the CEO, but also on the management team. Look into how R&D is affected for retiring CEOs based on management team characteristics.	Find that short-term horizon CEOs curtail R&D investments. Further find that TMT tenure and age affect the retiring CEO's decision making and the firm's R&D intensity.
Abernethy, Jiang & Kuang (2019)	Agency Theory & Identity Theory	Panel data of 3047 firm observation between 2001-2015 (US)	OLS regression, fixed effects estimate and logit regression	Argue that retiring CEOs make short-term decisions to maximise personal wealth, which can be mitigated when CEOs have strong organizational identification. Measured through the effects on R&D expenditures, CSR rating and the number of future year-end earnings forecasts.	Find significant support for the horizon problem as well as the hypotheses of organisational identification in the models using R&D expenditure and CSR rating as dependent variable, though not for the number of future earnings forecasts.

Table 4. Empirical Articles on the CEO Horizon Problem Based on the Agency Theory and Prospect Theory

Author	Theory	Data	Method	Hypothesis and predictions	Conclusion
Matta & Beamish (2008)	Agency & Prospect Theory	293 firms between 1995-1999 (US)	Logistic regression analysis	Based on the agency and the prospect theory, hypothesise that equity and option holdings and legacy conservation leads to retiring CEOs to decrease international acquisitions.	Find that the closer a CEO is to retirement, the less likely it is that a CEO will engage in international acquisitions, and that equity and option holdings further accentuate this.
Cassell, Huang & Sanchez (2013)	Agency & Prospect Theory	272 retirements (US)	OLS	Predict that the future earnings forecasting behaviour of retiring CEOs will be opportunistic (convey good over bad) and increase in frequency.	Find significant support that retiring CEOs change their forecasting behaviour, and furthermore that CEO equity incentives increase opportunistic

					terminal-year forecasting behaviour.
Xu & Yan (2014)	Agency & Prospect Theory	264 retirements (US)	Generalized Least Squared (GLS) random effects model.	Argue that retiring CEOs will decrease innovation spending, examining firms' innovative patent holdings. Predict that vested in-the-money option holdings will have an accentuating and bigger impact on the horizon problem behaviour than unvested options would.	Partially find support for the CEO horizon problem and decreases of innovative patent holdings and find evidence for their hypothesis that CEO vested option holdings have a negative effect on the firm's innovative patent holdings.
Alfonso, Brooks, Simonov & Zhang (2019)	Agency & Prospect Theory	2577 firms between 1992-2013 (US)	Logistic regression	Hypothesise that retiring CEOs will involve in expectation management and try to manage analysts' expectations upwards because incentives from compensation contracts are more important for late-stage CEOs.	Find robust evidence that retiring CEOs engage in expectation management to meet or beat analyst forecasts, argued to be due to a desire boost the value of their equity compensation.
Silberzahn & Arregle (2019)	Agency & Prospect & Social Identity Theory	Observations of 476 CEOs in the age group 60-75, between 1991-2010 (US)	Generalized Linear Models (GLM)	Predict that retiring CEOs will decrease capital investments, but two CEO traits would mitigate this; if the CEO is a lone-founder or has historically acquired a majority stake, implying high social identification to the firm.	Find significant support for the CEO horizon problem as retiring CEOs decrease capital investments, and that being a lone founder mitigates this.

Table 5. Corporate Governance Variables Included in Previous Research

Variable	Study including the governance variable
Board Size	Oh et al. (2016), Conyon & Florou (2006), Chen et al. (2018), Fang et al. (2018)
Institutional Ownership	Abernethy et al. (2019), Matta & Beamish (2008), Chen et al. (2018)
Independence of Board	Oh et al. (2016), Conyon & Florou (2006), Abernethy et al. (2019), Silberzahn & Arregle (2019), Fang et al. (2018), Chen et al. (2018)
CEO Duality	Oh et al. (2016), Chen et al. (2018), Silberzahn & Arregle (2019), Fang et al. (2018)
BCF Anti-Takeover Index	Chen et al. (2018)
Staggered Board	Chen et al. (2018)
Ownership of Controlling Shareholder	Fang et al. (2018)
Blockholder Ownership	Oh et al. (2016)

The table above presents corporate governance variables included in the previous literature referred to in this paper. Some variables are included in several studies.

Table 6. Comparison with Antecedents of Social Identification and Characteristics of CEOs in Swedish Spheres

Antecedents of social identification (Ashforth & Mael 1989 and Mael & Ashforth 1992)	Characteristics of CEOs in Swedish spheres	Compatible
Distinctiveness *between* the category's values and practices to other categories will strengthen social identification to the social category.	Spheres have a long history and has a dominant position in Swedish business (Carlsson, 2007).	Yes
Distinctiveness *within* a category's values and practices will strengthen social identification to the social category.	Spheres are a 'brotherhood' of relations built on trust and a small network (Collin, 1993).	Yes
Social identification entails that the individual acts in the best interest of one's perceived social category.	Managers in spheres prioritise stakeholders and long-term relations of the firm (Li, 1994).	Yes
Perceived prestige of a category will increase social identification to this category.	Business groups are carriers of social capital (Smångs, 2006) and provides its members with networks and career opportunities (Carlsson, 2007).	Potentially
Out-of-group salience, i.e. awareness of other categories will increase social identification.	N/A	No
Intergroup competition helps define a social category and will strengthen social identification to the category.	Managers in sphere-owned firms compete between spheres, rather between firms (Lubatkin et al., 2005).	Yes
A high degree of contact between the actor and the social category will strengthen social identification.	Managers in spheres are often hired between firms (Carlsson, 2007), and therefore can stay for a long time in a sphere.	Yes
Factors commonly associated with group formation (degree of overlap between organisational identity and personal identity in the actor's perception)	N/A	No

The table above shows our process of developing a theoretical linkage of social identity theory to the social characteristics for CEOs in Swedish listed firms within spheres. In the left column, the antecedents of social identification as presented by theory is listed. In the middle column, we present characteristics of business spheres and CEOs in business spheres in the Swedish national context. In the right column, we have conducted a compatibility analysis between the proposed antecedents from social identity theory and characteristics of business spheres and CEOs in business spheres in Sweden, indicating if CEOs of Swedish business spheres are believed to be able to exhibit social identification to the business sphere in which they work. While we are not able to match characteristics to all proposed antecedents, a complete set of antecedents is not argued to be necessary to create a strong social identification to a social category (Ashforth & Mael, 1989).

Table 7. Criteria for Social Identification of CEOs to Spheres

Criteria of our model	Underlying motivation
(1) The retirement takes place in a firm that is a part of a sphere	
(2) The tenure in the sphere of the retiring CEO is at least three years	The tenure of a director in the organisation is argued to increase the director's social identification to the organisation (Hillman et al., 2008)
(3) The retiring CEO serves in one or several company boards that are part of the sphere, before or after the retirement	The degree of contact between a social category and an individual is argued to lead to stronger identification (Mael & Ashforth, 1992) why we argue that board work in the same sphere will strengthen the social identification
(4) The retiring CEO has not held any CEO position outside of the sphere	Social identification is argued to increase given no previous directorship outside of the firm (Hillman et al., 2008)
(5) The retiring CEO owns equity in the firm from which it retires from	Directors owning equity in an organisation more strongly identifies with shareholders, owners of the sphere in our case (Hillman et al., 2008)

This table presents the underlying criteria for the construction of the variable on CEO 'social identification to sphere' included in regression model 4. In the right column, we present the underlying motivation based on Hillman et al.'s (2008) model and Mael and Ashforth (1992) for the criteria included in the development of the variable. The indicator variable on sphere identification indicates 1 if either all the criteria of (1), (2) and (3) are met or all criteria of (1), (2), (4) and (5) are met.

Table 8. Definitions of Control Variables

Variable	Prediction	Definition	Source
CEO salary	?	CEO yearly base salary	Firm annual reports
CEO STI	-	CEO yearly short-term incentives	Firm annual reports
CEO options	?	Indicator variable if CEO holds any options per year	Swedish Financial Supervisory Authority
CEO ownership	?	Percentage of CEO shareholding to total number of shares	Swedish Financial Supervisory Authority
CEO LTI	?	CEO yearly long-term incentives	Firm annual reports
CEO education	+	CEO level of education from high school to PhD	Firm annual reports
CEO tenure	-	CEO's number of years in office	Anonymised board data
Firm age	-	Number of years since firm registration	Retriever

Previous firm performance	+	Firm return on assets (ROA) lagged one year	Serrano
Firm size	?	Number of employees lagged one year	Serrano
Previous firm leverage ratio	+	Firm leverage ratio lagged one year	Serrano
Previous firm free cash flow	+	Firm free cash flow lagged one year and scaled by sales	Serrano
Previous firm Tobin's Q	+	Firm market value of debt and equity divided by the replacement costs of firm's assets (Ross, Westerfield & Jordan, 2016)	Serrano
Relay process	+	Indicator variable if CEO retirement is conducted through a relay process	Anonymised board data
Earnings based variable pay	-	Indicator variable if CEO variable pay is based on firm earnings	Firm annual reports
Inverse Mills ratio (IMR)	?	IMR using two-stage model with several predicting variables including; firm size, performance, leverage, free cash flow, CEO compensation, CEO tenure and year	Serrano and Firm annual reports

The table above reports the prediction, definition and the source of retrieval for all control variables included in regression model 1-4. Note that we are not able to make sign predictions for some variables.

Table 9. Probit Regression for the First-Stage of the Heckman Model

retire	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
size	0.01	0.04	0.23	0.820	-0.060	0.080	
ROA	-0.61	0.34	-1.80	0.070	-1.280	0.050	*
leverage	0.57	0.29	1.94	0.050	-0.010	1.140	*
FCF	-0.01	0.03	-0.37	0.710	-0.070	0.050	
CEOsalary	0.39	0.11	3.47	0.000	0.170	0.610	***
CEOSTI	0.04	0.06	0.73	0.460	-0.070	0.160	
CEOLTI	-0.13	0.08	-1.70	0.090	-0.280	0.020	*
CEOtenure	0.56	0.10	5.50	0.000	0.360	0.760	***
2001	0.00	.	.	.	.	.	
2002	0.08	0.28	0.28	0.780	-0.460	0.620	
2003	-0.45	0.31	-1.44	0.150	-1.060	0.160	
2004	-0.82	0.36	-2.28	0.020	-1.520	-0.110	**
2005	-0.67	0.33	-2.05	0.040	-1.310	-0.030	**
2006	-1.01	0.38	-2.66	0.010	-1.760	-0.270	**
2007	-0.62	0.32	-1.95	0.050	-1.240	0.000	*
2008	-0.84	0.34	-2.47	0.010	-1.500	-0.170	**
2009	-1.20	0.39	-3.11	0.000	-1.960	-0.440	***
2010	-0.71	0.32	-2.20	0.030	-1.340	-0.080	**
2011	-0.84	0.34	-2.49	0.010	-1.500	-0.180	**
2012	-0.99	0.35	-2.82	0.000	-1.680	-0.300	***
2013	-0.87	0.34	-2.59	0.010	-1.530	-0.210	**
2014	-0.87	0.34	-2.58	0.010	-1.520	-0.210	**

2015	-0.90	0.34	-2.66	0.010	-1.570	-0.240	**
2016	-0.79	0.34	-2.35	0.020	-1.450	-0.130	**
2017	-0.81	0.34	-2.37	0.020	-1.470	-0.140	**
Constant	-2.93	0.29	-9.99	0.000	-3.510	-2.360	***

Mean dependent var	0.02	SD dependent var	0.15
Pseudo r-squared	0.13	Number of obs	3538.00
Chi-square	101.45	Prob > chi2	0.00
Akaike crit. (AIC)	728.03	Bayesian crit. (BIC)	882.31

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

This table presents the results from our first-stage probit regression in the two-stage Heckman model. A lambda value of the results from this regression is then calculated to receive the value of the Inverse Mills ratio (IMR) that is included in the second-stage models of our following regressions. Variable description: $retire$ = 1 for last full year prior to CEO retirement, $size$ = lagged natural logarithm of number of employees, ROA = lagged net income divided by two-year lagged total asset value, $leverage$= lagged leverage ratio, FCF = lagged natural logarithm free cash flow, $CEOsalary$ = natural logarithm of CEO base salary, $CEOSTI$ = natural logarithm of CEO STI, $CEOLTI$ = natural logarithm of CEO LTI, $CEOtenure$ = natural logarithm of number of years that the CEO has been in position and indicator variables for year. The significance levels are based on a two-sided t-test.

Table 10. Difference in Variable Definition Between Regression Model 1 and Silberzahn and Arregle's (2019) Regression Model 2

Variable	Measured the same?	Difference	Reason for difference
CEO horizon	No	We include an indicator variable for the last full year prior to retirement where threshold of turnover age of 58 is applied. Silberzahn and Arregle (2019) use time left from age 60 until a presumed retirement age of 75 years old	We wish to capture CEO retirement differently to be able to use a control group of all CEOs, not only those that are near retirement
CEO salary	Yes		
CEO bonus (STI)	Yes		
CEO options	No	We include an indicator variable for options. Silberzahn and Arregle (2019) measure the value of in-the-money options	The data available in firm annual reports was not sufficient to conduct a valuation
CEO ownership	Yes		
CEO LTI	Yes		
CEO education	Yes		

CEO tenure	Yes		
CEO duality	No	Not included in regression	Not applicable in Swedish setting as CEO cannot also be chairman in Sweden
Proportion of independent directors on board	No	Not included in main regression	Lack of data. No require to be disclosed prior to 2008 in Swedish annual reports
Succession	No	Not included in regression	Not needed as we construct a different measure for CEO retirement
Firm age	Yes		
Previous firm performance	Yes		
Firm size	Yes		
Previous firm leverage ratio	Yes		
Previous firm free cash flow	Yes		
Previous firm Tobin's Q	Yes		
Inverse Mills Ratio	Yes		
Industry effects	Yes		
Year effects	Yes		

Our regression model 1 follows the study conducted by Silberzahn and Arregle (2019), with certain adaptations to the Swedish context and data availability. This table shows the differences between our regression model 1 and Silberzahn and Arregle's (2019) Regression Model 2. Firstly, our data differs in the sense that their data is on US firms and our data is on Swedish ones. This difference makes some variables inapplicable and other not possible to our study. Secondly, Silberzahn and Arregle's (2019) study focuses on CEOs between the ages of 60 and 75, a time period that the authors believe correspond to a pre-retirement period. This entails that Silberzahn and Arregle (2019) need to include a variable for when the CEOs in that age span are involved in a succession. Our dataset contains all CEOs in Swedish public firms, singling out the retirement period through our independent variable. Lastly, since our dependent variable not only ranges from 0 to 1, we do not apply a GLM regression to our study as done in Silberzahn and Arregle's (2019) study.

Table 11. Reasons for Removals and Development of Sample

Reasons for removal	
	N
Original dataset	**4,696**
Firms listed two years or less	158
Foreign firms	377
Joint stock banks	82

Missing data in datasets	530
Annual reports not found	11
Total removed observations	1,158
Total observations used in sample	3,538

The table shows the total number of observations in the original data sample and the reasons for removal. Also specified is the number of observations per reason for removal. The number of observations in the original dataset equals the sum of the removed and included observations.

Table 12. Variable and Method Design and Empirical Evidence in Extant Literature

Author(s) (year)	Number of observations (retirements), datatype	Country	Dependent variable	Independent variable	Evidence of CEO horizon problem?
Conyon & Florou (2006)	3389 (90), panel data	United Kingdom	$CAPEX_{it} = (cost\ new\ fixed\ assets_{it} / replacement\ cost\ of\ capital\ stock_{it})$ $CUTRD_{it} = 1\ if\ R\&D_{it} < R\&D_{it-1}$	Indicator variable for real retirements	No
Cazier (2011)	2378 (203), cross-sectional data	United States	$R\&D_i = (R\&D_t / Sales_t)$	Indicator variable for each of the five years prior to a retirement	No
Abernethy, Jiang & Kuang (2019)	3047 (3047), panel data	United States	$RDEXP_{it} = \log(R\&D\ expenses_{it})$ $CSR_{it} = CSR\ commitment\ score$ $FORECAST_{it} = number\ of\ year\ end\ forecasts_{it}$	Indicator variable if CEO > 63 years old	Yes
Silberzahn & Arregle (2019)	1622 (476), panel data	United States	$capital\ investments_{it} = (CAPEX_{it} / PPE_{it})$	Continuous variable for time left until retirement	No for CEO horizon alone, Yes for interaction term

This table reports the research design employed in previous studies in the research field. The selected studies are the ones regarded as the most relevant to our study given the year of publication and the dependent variable employed.

Table 13. Sample Table Years

	Observations	%	Cum. %	Retirements	%	Cum. %
2001	194	5.48	5.48	4	4.88	4.88
2002	210	5.94	11.42	9	10.98	15.85

2003	219	6.19	17.61	4	4.88	20.73
2004	220	6.22	23.83	2	2.44	23.17
2005	214	6.05	29.88	4	4.88	28.05
2006	213	6.02	35.90	2	2.44	30.49
2007	221	6.25	42.14	5	6.10	36.59
2008	217	6.13	48.28	4	4.88	41.46
2009	208	5.88	54.15	2	2.44	43.90
2010	205	5.79	59.95	7	8.54	52.44
2011	202	5.71	65.66	5	6.10	58.54
2012	208	5.88	71.54	4	4.88	63.41
2013	208	5.88	77.42	5	6.10	69.51
2014	206	5.82	83.24	6	7.32	76.83
2015	205	5.79	89.03	5	6.10	82.93
2016	196	5.54	94.57	7	8.54	91.46
2017	192	5.43	100.00	7	8.54	100.00

The table above shows the sample distribution between years, both by number, as a ratio of total number of observations across all years and cumulatively. Moreover, the number of retirements per year is also indicated in discrete values, in percentage of total number of retirement observations and cumulatively.

Table 14. Sample Table Industry

Industries	Observations	%	Cum. %	Retirements	%	Cum.
basic materials	198	5.72	5.72	9	11.11	11.11
consumer goods	388	11.20	16.92	14	17.28	28.40
consumer services	359	10.36	27.28	4	4.94	33.33
financials	582	16.80	44.08	10	12.35	45.68
health care	375	10.83	54.91	8	9.88	55.56
industrials	933	26.93	81.84	29	35.80	91.36
oil & gas	11	0.32	82.16	0	0	96.30
technology	522	15.07	97.23	4	4.94	96.30
telecommunications	77	2.22	99.45	3	3.70	100.00
utilities	19	0.55	100.00	0	0	100.00

The table above shows the distribution of observations between industries, both by number, as a ratio of total number of observations across all industries and cumulatively. Moreover, the number of retirements per industry is also indicated in discrete values, in percentage of total number of retirement observations and cumulatively.

Table 15. Descriptive Statistics

	(1)	(2)	(3)	(4)	(5)
Variables	N	mean	sd	min	max
CAPEX	3,538	0.935	1.837	-0.304	9.771
retire	3,538	0.0232	0.150	0	1
CEOsalary (MSEK)	3,538	3.432	2.789	0	23.30
CEOSTI (MSEK)	3,538	1.116	2.108	-0.640	19.69
CEOoption	3,538	0.588	0.492	0	1
CEOshares (%Owned)	3,538	0.0199	0.0681	0	0.423
CEOLTI	3,538	0.218	1.018	-1.920	20.46
CEOedu	3,538	3.639	0.986	0	5
CEOtenure	3,538	5.113	3.833	1	17
Firm age	3,538	35.65	28.81	1	120
ROA	3,538	0.0204	0.186	-0.824	0.496
Size (‘000 employees)	3,538	4.965	13.63	0.00400	87.14
leverage	3,538	0.493	0.203	0.0212	0.946
FCF	3,538	0.127	2.029	-14.59	7.414
TobinsQ	3,538	1.363	1.615	0.104	10.62
relay	3,538	0.00565	0.0750	0	1
earnbased	3,538	0.522	0.500	0	1
ownercon	3,462	0.461	0.201	0.0953	0.926
sphere	3,538	0.199	0.399	0	1
IMR	3,538	2.614	0.495	1.057	4.563

This table reports descriptive statistics for the sample used in the regressions in this paper. Note that the number of observations of ownership concentration is lower compared to remaining variables due to missing data, why the regressions including the variables on ownership concentration is run on a smaller sample. Variable description: $CAPEX$ = net capital expenditures over PPE, $retire$ = 1 for last full year prior to CEO retirement, $CEOsalary$ = CEO base salary, $CEOSTI$ = CEO STI, $CEOoption$ = 1 if CEO hold firm options, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = CEO LTI, $CEOedu$ = takes on value 0-5 depending on education level, $CEOtenure$ = number of years that the CEO has been in position, $firmage$ = number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = number of employees, $leverage$= lagged leverage ratio, FCF = lagged free cash flow, $TobinsQ$ = lagged Tobin’s Q, $relay$ = 1 if turnover is conducted through a relay process, $earnbased$ = 1 if CEO STI is based on earnings-based results, $ownercon$ = percentage of voting rights belonging to the three biggest shareholders, $sphere$ = 1 if the CEO might socially identify with a business sphere, IMR = Inverse Mills ratio from first-stage probit regression model.

Table 16. Pearsons Correlation Table

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) CAPEX	1.00						
(2) CEOsalary	-0.15***	1.00					
(3) CEOSTI	-0.07***	0.56***	1.00				
(4) CEOshares	-0.02	-0.16***	-0.11***	1.00			
(5) CEOLTI	-0.05***	0.35***	0.26***	-0.06***	1.00		
(6) CEOedu	0.02	0.16***	0.09***	-0.04***	0.07***	1.00	
(7) CEOtenure	-0.02	0.11***	0.10***	0.13***	0.07***	0.10***	1.00
(8) Firm age	-0.19***	0.39***	0.21***	-0.08***	0.25***	0.07***	0.09***
(9) ROA	-0.13***	0.14***	0.12***	0.04**	0.03*	0.02	0.21***
(10) size	-0.12***	0.66***	0.40***	-0.09***	0.33***	0.08***	0.03**
(11) leverage	-0.12***	0.16***	0.12***	-0.03*	0.02	-0.03*	-0.03*
(12) FCF	-0.07***	0.04**	0.03*	0.02	0.01	-0.03**	0.08***
(13) TobinsQ	0.15***	-0.04**	-0.01	0.03**	-0.02	0.05***	0.07***
(14) ownercon	-0.12***	-0.05***	-0.06***	0.25***	-0.03	-0.05***	0.19***
(15) IMR	0.11***	-0.49***	-0.33***	0.03*	-0.12***	-0.08***	-0.57***

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Variables	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(8) Firm age	1.00							
(9) ROA	0.19***	1.00						
(10) size	0.41***	0.09***	1.00					
(11) leverage	0.06***	0.00	0.17***	1.00				
(12) FCF	0.08***	0.36***	0.01	0.16***	1.00			
(13) TobinsQ	-0.12***	0.02	-0.04**	-0.37***	-0.16***	1.00		
(14) ownercon	0.10***	0.17***	-0.03*	0.01	0.08***	-0.08***	1.00	
(15) IMR	-0.20***	0.01	-0.33***	-0.27***	0.00	0.03	-0.03**	1.00

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The table above presents the results from Pearson's correlation test. The table reports the correlation between variables included in our regression models. As Pearson's correlation test is only applicable to continuous variables, we have excluded the indicator variables included in our regression models. Variable description: $CAPEX$ = net capital expenditures over PPE, $CEOsalary$ = CEO base salary, $CEOSTI$ = CEO STI, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = CEO LTI, $CEOedu$ = takes on value 0-5 depending on education level, $CEOtenure$ = number of years that the CEO has been in position, $firmage$ = number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = lagged of number of employees, $leverage$= lagged leverage ratio, FCF = lagged free cash flow, $TobinsQ$ = lagged Tobin's Q, $ownercon$ = percentage of voting rights belonging to the three biggest shareholders, IMR = Inverse Mills ratio from first-stage probit regression model. The significance levels are based on a two-sided t-test.

Table 17. Regression Model 1

	Regression Model 1 Univariate	Regression Model 1 FE	Regression Model 1 FE four-way
retire	-0.428***	-0.243***	-0.0825
	(-4.24)	(-2.46)	(-1.01)
CEOsalary		0.194	0.00258
		(0.18)	(0.00)
CEOSTI		0.0615	-0.00742
		(0.51)	(-0.05)
CEOoption		0.130	0.233
		(1.21)	(1.23)
CEOshares		-0.837*	0.0497
		(-1.73)	(0.07)
CEOLTI		-0.139	-0.0511
		(-0.40)	(-0.13)
CEOedu		0.0487*	
		(1.41)	
CEOtenure		0.155	0.239
		(0.10)	(0.13)
firmage		-0.114**	0.423
		(-1.78)	(1.23)
ROA		-0.866	0.919
		(-0.47)	(0.47)
size		-0.180***	-0.256*
		(-3.49)	(-1.94)
leverage		0.155	-0.728
		(0.09)	(-0.43)
FCF		-0.00847	-0.0218
		(-0.25)	(-0.48)
TobinsQ		0.0465	0.0240
		(1.24)	(0.40)
IMR		0.441	0.141
		(0.14)	(0.04)
Constant	0.925***	-0.698	-1.134
	(392.08)	(-0.06)	(-0.08)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
CEO FE	No	No	Yes
Firm FE	No	No	Yes
_cons	No	No	No
Adjusted R^2	0.102	0.155	0.449
Degrees of freedom	1	15	14
Observations	3538	3464	3258

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table presents the regression results from the regression model 1, testing hypothesis 1. The first column from the left presents the variables. The second column from the left shows the results from the univariate test for CEO retirement on firm net capital expenditures controlling for fixed effects on year and industry. The third column from the left is a multivariate regression testing retirement on net capital expenditures and controlling for fixed effects for year and industry. In the column to the right, the results from our four-way fixed effects regression model 1 is presented. As differences in CEO education is controlled for through CEO fixed effects, this variable is omitted, otherwise, the four-way fixed effects regression contains the same control variables as does the two-way fixed effects regression. Variable description: $CAPEX$ = net capital expenditures over PPE, $retire$ = 1 for last full year prior to CEO retirement, $CEOsalary$ = natural logarithm of CEO base salary, $CEOSTI$ = natural logarithm of CEO STI, $CEOoption$ = 1 if CEO hold firm options, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = natural logarithm of CEO LTI, $CEOedu$ = takes on value 0-5 depending on education level, $CEOtenure$ = natural logarithm of number of years that the CEO has been in position, $firmage$ = natural logarithm of number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = lagged natural logarithm of number of employees, $leverage$= lagged leverage ratio, FCF = lagged natural logarithm free cash flow, $TobinsQ$ = lagged Tobin's Q, IMR = Inverse Mills ratio from first-stage probit regression model. Significance levels are based on a one-sided t-test, except for variables $CEOsalary$, $CEOoption$, $CEOshares$, $CEOLTI$, $size$ and IMR.

Table 20. Additional Tests on Agency Theory-Based Predictions

	Regression Depreciation FE	Regression CEOSTI FE	Regression Earningsbased FE	Regression Earningsbased CEOSTI FE
retire	-0.00599	-0.306***	-0.403**	
	(-0.07)	(-2.61)	(-2.18)	
retire x CEOSTI		0.0937		
		(1.26)		
retire x earnbased			0.230	
			(1.11)	
retire x earnbased x CEOSTI				0.0577
				(0.54)
CEOsalary	-1.054	0.147	0.192	0.00835
	(-1.01)	(0.13)	(0.18)	(0.01)
CEOSTI	-0.0676	0.0559	0.0628	0.0184
	(-0.72)	(0.46)	(0.52)	(0.15)
CEOoption	0.298	0.130	0.129	0.130
	(1.50)	(1.21)	(1.20)	(1.21)
CEOshares	2.867	-0.841*	-0.838*	-0.830*
	(1.18)	(-1.73)	(-1.73)	(-1.72)
CEOLTI	0.355	-0.122	-0.138	-0.0771
	(1.04)	(-0.35)	(-0.40)	(-0.23)
CEOedu	-0.0100	0.0483	0.0488*	0.0505*
	(-0.18)	(1.40)	(1.41)	(1.47)
CEOtenure	-1.560	0.0904	0.157	-0.113
	(-1.03)	(0.06)	(0.10)	(-0.07)
firmage	0.0288	-0.114**	-0.114**	-0.113**

	(0.65)	(-1.79)	(-1.79)	(-1.77)
ROA	1.533	-0.804	-0.877	-0.571
	(0.84)	(-0.44)	(-0.48)	(-0.32)
size	-0.0338	-0.182***	-0.181***	-0.184***
	(-1.13)	(-3.54)	(-3.52)	(-3.60)
leverage	-1.788	0.0888	0.154	-0.116
	(-1.16)	(0.05)	(0.09)	(-0.07)
FCF	-0.302	-0.00757	-0.00885	-0.00327
	(-1.56)	(-0.22)	(-0.26)	(-0.10)
TobinsQ	-0.0730	0.0477	0.0479	0.0463
	(-1.13)	(1.27)	(1.27)	(1.23)
relay	-0.0176	0.241	0.225	0.132
	(-0.18)	(0.98)	(0.93)	(0.57)
earnbased	-0.0299	0.0429	0.0380	
	(-0.56)	(0.41)	(0.36)	
IMR	-2.843	0.312	0.442	-0.0788
	(-0.98)	(0.10)	(0.14)	(-0.03)
Constant	11.43	-0.221	-0.725	1.314
	(1.01)	(-0.02)	(-0.06)	(0.11)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.081	0.155	0.155	0.154
Degrees of freedom	17	18	18	18
Observations	3464	3464	3464	3464

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports the results from our additional tests for the predictions of the agency theory. The regressions are based on regression model 2, controlling for two-way fixed effects. The first column from the left presents the variables. The second column from the left presents the results from the regression run with depreciation scaled to sales as the dependent variable. The third column from the left reports the results from the regression run with an independent variable, an interaction term between CEO STI and retirement on net capital expenditures. The fourth column from the left shows the regression adding an independent variable, an interaction term between retirement and earnings-based incentives, representing the effect that the compensation structure of earnings-based incentives has on net capital expenditures in a firm with a retiring CEO. The column to the right exhibits the regression adding an independent variable, an interaction term between retirement, CEO STI and the indicator variable on earnings-based CEO STI, representing the effects that earnings-based CEO STI has on net capital expenditures in a firm with a retiring CEO. Variable description: $CAPEX$ = net capital expenditures over PPE, $retire$ = 1 for last full year prior to CEO retirement, $CEOsalary$ = natural logarithm of CEO base salary, $CEOSTI$ = natural logarithm of CEO STI, $CEOoption$ = 1 if CEO hold firm options, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = natural logarithm of CEO LTI, $CEOedu$ = takes on value 0-5 depending on education level, $CEOtenure$ = natural logarithm of number of years that the CEO has been in position, $firmage$ = natural logarithm of number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = lagged natural logarithm of number of employees, $leverage$= lagged leverage ratio, FCF = lagged natural logarithm free cash flow, $TobinsQ$ = lagged Tobin's Q, IMR = Inverse Mills ratio from first-stage probit regression model, $relay$ = 1 if turnover is conducted through a relay process, $earnbased$ = 1 if CEO STI is based on earnings-based results. New variables created specifically for these regressions: $depreciation$ = depreciation scaled by sales, $retire \times CEOSTI =$ the effect that CEO STI has on net capital expenditures in a firm with a retiring CEO, $retire \times earnbased =$ the effect that earnings-based incentives has on net capital expenditures in a firm with a retiring CEO, $retire \times CEOSTI \times earnbased$ = the effects that earnings-based CEO STI has on net capital expenditures in a firm with a retiring CEO. Significance levels are based on a one-sided t-test, except for variables $CEOsalary$, $CEOoption$, $CEOshares$, $CEOLTI$, $size$ and IMR.

Table 21. Additional Tests on Prospect Theory-Based Predictions

	Regression Equity FE	Regression Adjusted Equity FE	Regression Options FE	Regression CEOLTI FE
retire	-0.275***	-0.266***	-0.223	-0.267***
	(-2.60)	(-2.51)	(-1.19)	(-2.58)
CEOshares	-0.844*		-0.838*	-0.838*
	(-1.73)		(-1.73)	(-1.73)
retire x CEOshares	1.185			
	(0.80)			
adequity		-0.000381		
		(-1.02)		
retire x adequity		0.00197		
		(0.86)		
CEOoption			0.131	
			(1.21)	
retire x CEOoption			-0.0715	
			(-0.34)	
retire x CEOLTI				0.234**
				(2.18)
CEOsalary	0.203	0.220	0.205	0.262
	(0.19)	(0.20)	(0.19)	(0.24)
CEOSTI	0.0641	0.0659	0.0641	0.0715
	(0.53)	(0.54)	(0.53)	(0.59)
CEOoption	0.129	0.135		0.131
	(1.20)	(1.26)		(1.22)
CEOLTI	-0.141	-0.141	-0.142	-0.170
	(-0.41)	(-0.40)	(-0.41)	(-0.49)
CEOedu	0.0483*	0.0507*	0.0483*	0.0484*
	(1.40)	(1.37)	(1.39)	(1.40)
CEOtenure	0.172	0.154	0.174	0.259
	(0.11)	(0.10)	(0.11)	(0.17)
firmage	-0.114**	-0.115**	-0.114**	-0.113**
	(-1.79)	(-1.78)	(-1.78)	(-1.78)
ROA	-0.893	-0.955	-0.895	-0.989
	(-0.49)	(-0.52)	(-0.49)	(-0.54)
size	-0.181***	-0.185***	-0.181***	-0.180***
	(-3.52)	(-3.55)	(-3.52)	(-3.51)
leverage	0.169	0.135	0.170	0.255
	(0.10)	(0.08)	(0.10)	(0.16)
FCF	-0.00902	-0.00484	-0.00896	-0.0105
	(-0.27)	(-0.14)	(-0.27)	(-0.31)
TobinsQ	0.0478	0.0490*	0.0477	0.0474
	(1.27)	(1.30)	(1.27)	(1.26)
relay	0.217	0.204	0.244	0.273
	(0.87)	(0.81)	(0.98)	(1.13)
earnbased	0.0432	0.0506	0.0429	0.0432

	(0.41)	(0.48)	(0.41)	(0.41)
IMR	0.472	0.455	0.476	0.643
	(0.15)	(0.15)	(0.15)	(0.21)
Constant	-0.841	-0.801	-0.858	-1.507
	(-0.07)	(-0.07)	(-0.07)	(-0.12)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.155	0.155	0.155	0.155
Degrees of Freedom	18	18	18	18
Observations	3464	3430	3464	3464

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports the results from our additional tests for the predictions of the prospect theory. The regressions are based on regression model 2, controlling for two-way fixed effects. The first column from the left presents the variables. The following columns presents the results from our regressions adding interaction terms on CEO retirement and equity ownership, CEO equity adjusted by total compensation, option holdings and CEO LTI respectively. Variable description: $CAPEX$ = net capital expenditures over PPE, $retire$ = 1 for last full year prior to CEO retirement, $CEOsalary$ = natural logarithm of CEO base salary, $CEOSTI$ = natural logarithm of CEO STI, $CEOoption$ = 1 if CEO hold firm options, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = natural logarithm of CEO LTI, $CEOedu$ = takes on value 0-5 depending on education level, $CEOtenure$ = natural logarithm of number of years that the CEO has been in position, $firmage$ = natural logarithm of number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = lagged natural logarithm of number of employees, $leverage$= lagged leverage ratio, FCF = lagged natural logarithm free cash flow, $TobinsQ$ = lagged Tobin's Q, IMR = Inverse Mills ratio from first-stage probit regression model, $relay$ = 1 if turnover is conducted through a relay process, $earnbased$ = 1 if CEO STI is based on earnings-based results. New variables created specifically for these regressions: $retire \times CEOshares =$ the effect that CEO equity holding has on net capital expenditures in a firm with a retiring CEO, $retire \times adequity =$ the effect that equity scaled by total CEO compensation has on net capital expenditures in a firm with a retiring CEO, $retire \times CEOoption =$ the effects that CEO option holding has on net capital expenditures in a firm with a retiring CEO, $retire \times CEOLTI =$ the effects that CEO LTI has on net capital expenditures in a firm with a retiring CEO. Significance levels are based on a one-sided t-test, except for variables $CEOsalary$, $CEOoption$, $CEOshares$, $CEOLTI$, $size$ and IMR.

Table 22. Validity Test of Variable and Robustness Tests

	Regression Retirement>62 FE	Regression 3 Year Horizon FE	Regression 5 Year Horizon FE	Regression R&D FE	Regression Age FE
retire63	-0.317**				
	(-2.30)				
horizon3		-0.232***			
		(-2.39)			
horizon5			-0.182**		
			(-1.87)		
retire				-0.655	-0.180*
				(-0.59)	(-1.62)
CEOage					-0.595*
					(-1.59)
CEOsalary	0.0724	0.212	0.176	-1.872	0.114
	(0.07)	(0.20)	(0.16)	(-0.72)	(0.10)

CEOSTI	0.0492	0.0646	0.0605	-0.382	0.0564
	(0.42)	(0.54)	(0.51)	(-1.15)	(0.47)
CEOoption	0.130	0.126	0.126	0.587	0.127
	(1.21)	(1.18)	(1.18)	(0.84)	(1.18)
CEOshares	-0.825*	-0.850*	-0.846*	1.447	-0.754
	(-1.70)	(-1.75)	(-1.74)	(0.45)	(-1.59)
CEOLTI	-0.0981	-0.140	-0.128	1.013	-0.110
	(-0.29)	(-0.41)	(-0.37)	(1.08)	(-0.32)
CEOedu	0.0491*	0.0445*	0.0442*	-0.264	0.0423
	(1.42)	(1.28)	(1.28)	(-1.08)	(1.22)
CEOtenure	-0.0165	0.186	0.134	-3.986	0.0509
	(-0.01)	(0.12)	(0.09)	(-1.04)	(0.03)
firmage	-0.115**	-0.114**	-0.114**	0.169	-0.114**
	(-1.80)	(-1.79)	(-1.79)	(0.92)	(-1.81)
ROA	-0.687	-0.902	-0.839	5.690	-0.740
	(-0.38)	(-0.49)	(-0.46)	(1.03)	(-0.40)
size	-0.183***	-0.181***	-0.181***	-0.281	-0.182***
	(-3.57)	(-3.53)	(-3.54)	(-1.22)	(-3.50)
leverage	-0.0245	0.193	0.145	-5.845	0.0194
	(-0.02)	(0.12)	(0.09)	(-1.18)	(0.01)
FCF	-0.00578	-0.00938	-0.00862	-1.982	-0.00751
	(-0.17)	(-0.28)	(-0.26)	(-1.33)	(-0.22)
TobinsQ	0.0478	0.0480*	0.0481*	-0.538	0.0438
	(1.27)	(1.28)	(1.28)	(-0.83)	(1.14)
relay	0.154	0.320	0.269	0.00122	0.296
	(0.66)	(1.34)	(1.15)	(0.00)	(1.23)
earnbased	0.0425	0.0442	0.0447	-0.767	0.0474
	(0.40)	(0.42)	(0.42)	(-1.13)	(0.45)
IMR	0.108	0.488	0.386	-8.735	0.182
	(0.04)	(0.16)	(0.13)	(-1.11)	(0.06)
Constant	0.578	-0.899	-0.502	34.86	2.590
	(0.05)	(-0.07)	(-0.04)	(1.13)	(0.21)
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.155	0.156	0.155	0.039	0.157
Degrees of Freedom	17	17	17	17	18
Observations	3464	3464	3464	2114	3448

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports the results from our variable validity test of retirement age and the robustness tests. The regressions are based on regression model 2, controlling for two-way fixed effects. The first column from the left presents the variables. The second column from the left shows the results from the regression with a new construction of the CEO retirement variable, applying a cut-off age of 63 years. The third and the fourth column from the left shows the results from the regression with a new construction of the CEO retirement variable, applying a horizon period of three and five years respectively. In the second column from the right, the results from the robustness test using R&D as the dependent variable is presented. Note that this regression entails a smaller sample due to fewer observations meeting the criteria of the variable on R&D. In the column to the right, the results from the robustness test using CEO age as a control variable is reported. Variable description: $CAPEX$ = net capital expenditures over PPE, $retire$ = 1 for last full year prior to CEO retirement, $CEOsalary$ = natural logarithm of CEO base salary, $CEOSTI$ = natural logarithm of CEO STI, $CEOoption$ = 1 if CEO hold firm options, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = natural logarithm of CEO LTI, $CEOedu$ = takes on value 0-5 depending on

education level, $CEOtenure$ = natural logarithm of number of years that the CEO has been in position, $firmage$ = natural logarithm of number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = lagged natural logarithm of number of employees, $leverage$= lagged leverage ratio, FCF = lagged natural logarithm free cash flow, $TobinsQ$ = lagged Tobin's Q, IMR = Inverse Mills ratio from first-stage probit regression model, $relay$ = 1 if turnover is conducted through a relay process, $earnbased$ = 1 if CEO STI is based on earnings-based results. New variables created specifically for these regressions: $retire63 =$ 1 for last full year prior to CEO retirement if CEO is 63 years or older, $horizon3 = 1$ for each of the three full years prior to a CEO retirements, $horizon5 = 1$ for each of the five full years prior to a CEO retirements $R\&D$ = R&D expenditures scaled by sales, $CEOage$ = natural logarithm of CEO age. Significance levels are based on a one-sided t-test, except for variables $CEOsalary$, $CEOoption$, $CEOshares$, $CEOLTI$, $size$ and IMR.

Table 23. Retirement Validity Test

Year	Firm name	Name	Age at classified retirement	Retirement?
2008	Gunnebo AB	Gezelius, Rolf Göran	58	Yes
2008	Lindab International AB	Åkesson, Kjell Rolf Krister	59	Yes
2017	AAK AB	Frank, Arne Alexander	59	No (passed away)
2002	ÅF AB	Grönkvist, Nils Gunnar Erik	59	Yes
2010	Geveko AB	Ljungkvist, Hans Erik	58	Yes
2004	Midsona AB	Håkansson, Bo Krister	58	Yes
2011	Cloetta AB	Petri, Kurt-Olof Stefan	59	Yes
2010	Knowit AB	Nilsson, Lars Anders	59	Yes
2002	Ericsson, Telefonaktiebolaget LM	Hellström, Kurt Roland	59	Yes
2016	Boule Diagnostics AB	Westman, Ernst Lennart	59	Yes

The table above reports the robustness test on ten randomly chosen retirements in our sample with CEOs in the ages 58 and 59.

Table 24. VIF Table – Regression Model 2

Variable	VIF	1/VIF
size	2.29	.44
CEOsalary	2.11	.47
leverage	1.34	.75
ROA	1.32	.76
CEOSTI	1.28	.78
firmage	1.25	.8
CEOtenure	1.24	.81
TobinsQ	1.23	.81
FCF	1.22	.82
CEOoption	1.14	.88
CEOshares	1.09	.92
Earnbased	1.08	.93
CEOedu	1.07	.93
retire	1.07	.93

CEOLTI	1.06	.94
relay	1.05	.95
Mean VIF	1.33	.

The table above shows the Variance Inflation Factor (VIF) for our regression model 2, run as an OLS regression with net capital expenditures as the dependent variable. $size$ is a continuous variable on lagged natural logarithm of number of employees. $CEOsalary$ is a continuous variable of the natural logarithm of CEO base salary. $leverage$ is a continuous variable on firm lagged leverage ratio. ROA is a continuous variable constructed by lagged net income divided by two-year lagged total asset value. $CEOSTI$ is a continuous variable for natural logarithm of CEO STI. $firmage$ is a continuous variable representing natural logarithm of number of years that firm has existed. $CEOtenure$ is natural a continuous variable representing logarithm of number of years that the CEO has been in position. $TobinsQ$ is a continuous variable on lagged Tobin's Q. FCF is a continuous variable representing lagged natural logarithm free cash flow. $CEOoption$ is an indicator variable, taking on value 1 if CEO hold firm options. $CEOshares$ is a continuous variable representing percentage of firm owned by CEO. $earnbased$ is an indicator variable, taking on value 1 if CEO STI is based on earnings-based results. $CEOedu$ is a discrete variable taking on value 0-5 depending on education level. $retire$ is an indicator variable showing if the observation is the last full year prior to CEO retirement. $CEOLTI$ is a continuous variable representing natural logarithm of CEO LTI. $relay$ is an indicator variable, taking on value 1 if turnover is conducted through a relay process.

Table 25. VIF Table – Regression Model 3 and 4

Variable	VIF	1/VIF
size	2.37	.42
CEOsalary	2.21	.45
leverage	1.35	.74
ROA	1.33	.75
CEOSTI	1.3	.77
firmage	1.3	.77
sphere	1.29	.78
CEOtenure	1.26	.8
TobinsQ	1.24	.81
FCF	1.2	.83
ownercon	1.19	.84
CEOoption	1.15	.87
CEOshares	1.14	.87
earnbased	1.08	.93
retire	1.07	.93
CEOedu	1.07	.93
CEOLTI	1.06	.94
relay	1.06	.95
Mean VIF	1.31	.

The table above shows the Variance Inflation Factor (VIF) for our regression model 3 and 4, run as an OLS regression with net capital expenditures as the dependent variable. $size$ is a continuous variable on lagged natural logarithm of number of employees. $CEOsalary$ is a continuous variable of the natural logarithm of CEO base salary. $leverage$ is a continuous variable on firm lagged leverage ratio. ROA is a continuous variable constructed by lagged net income divided by two-year lagged total asset value. $CEOSTI$ is a continuous variable for natural logarithm of CEO STI. $firmage$ is a continuous variable representing natural logarithm of number of years that firm has existed. $sphere$ is an indicator variable, taking on value 1 if the CEO exhibits social identification to a business sphere. $CEOtenure$ is natural a continuous variable representing logarithm of number of years that the CEO has been in position. $TobinsQ$ is a continuous variable on lagged Tobin's Q. FCF is a continuous variable representing lagged natural logarithm free cash

flow. $ownercon$ is a continuous variable covering the percentage of voting rights belonging to the three biggest shareholders. $CEOoption$ is an indicator variable, taking on value 1 if CEO hold firm options. $CEOshares$ is a continuous variable representing percentage of firm owned by CEO. $earnbased$ is an indicator variable, taking on value 1 if CEO STI is based on earnings-based results. $retire$ is an indicator variable showing if the observation is the last full year prior to CEO retirement. $CEOedu$ is a discrete variable taking on value 0-5 depending on education level. $CEOLTI$ is a continuous variable representing natural logarithm of CEO LTI. $relay$ is an indicator variable, taking on value 1 if turnover is conducted through a relay process.

Table 26. Robustness Tests

	Regression Indep.Dir. FE	Regression Industry Subsample FE	Regression Underinvest FE	Regression Overinvest FE
retire	-0.214**	-0.0873	-0.351	0.0480
	(-2.07)	(-1.04)	(-0.81)	(0.28)
independent	0.0619			
	(0.49)			
retire x independent	-0.354			
	(-0.98)			
CEOsalary	0.207	1.126	-3.514	-1.161
	(0.19)	(0.68)	(-0.93)	(-0.58)
CEOSTI	0.0640	0.128	-0.545	0.0114
	(0.53)	(0.76)	(-1.28)	(0.05)
CEOoption	0.125	-0.0212	0.110	0.0927
	(1.15)	(-0.19)	(0.34)	(0.63)
CEOshares	-0.841*	-0.388	-1.672*	-0.678
	(-1.74)	(-0.41)	(-1.94)	(-0.88)
CEOLTI	-0.141	-0.366	1.150	0.402
	(-0.40)	(-0.66)	(0.98)	(0.60)
CEOedu	0.0486*	0.0356	-0.120*	0.141***
	(1.40)	(0.78)	(-1.32)	(2.75)
CEOtenure	0.173	1.623	-5.685	-1.898
	(0.11)	(0.66)	(-1.04)	(-0.66)
firmage	-0.113**	-0.0479	-0.259**	0.0356
	(-1.79)	(-0.56)	(-1.67)	(0.39)
ROA	-0.903	-3.876*	5.538	1.610
	(-0.49)	(-1.48)	(0.94)	(0.50)
size	-0.180***	-0.0681	-0.319***	-0.432***
	(-3.44)	(-1.03)	(-2.76)	(-3.94)
leverage	0.175	1.021	-6.559	-0.838
	(0.11)	(0.35)	(-1.12)	(-0.28)
FCF	-0.00947	-0.0498	0.0899	0.0670
	(-0.28)	(-0.63)	(0.70)	(1.04)
TobinsQ	0.0471	0.162***	0.0148	-0.0298
	(1.26)	(2.79)	(0.42)	(-0.39)
relay	0.225	-0.195	-0.132	0.210
	(0.91)	(-1.07)	(-0.20)	(0.45)
earnbased	0.0440	-0.0119	0.150	0.00410

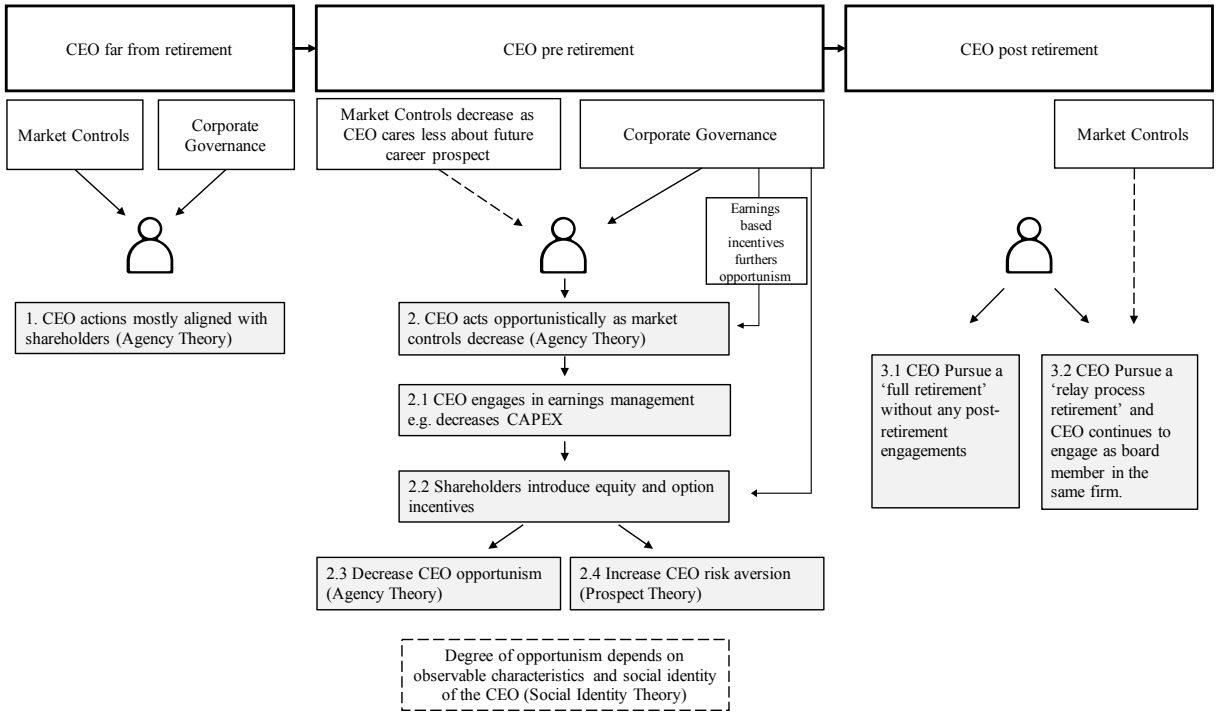
	(0.42)	(-0.08)	(0.63)	(0.03)
IMR	0.480	3.274	-10.79	-3.711
	(0.15)	(0.66)	(-1.00)	(-0.64)
Constant	-0.882	-11.71	44.66	14.13
	(-0.07)	(-0.61)	(1.06)	(0.63)
Industry FE	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.155	0.199	0.193	0.170
Degrees of Freedom	19	17	17	17
Observations	3464	933	697	765

t statistics in parentheses

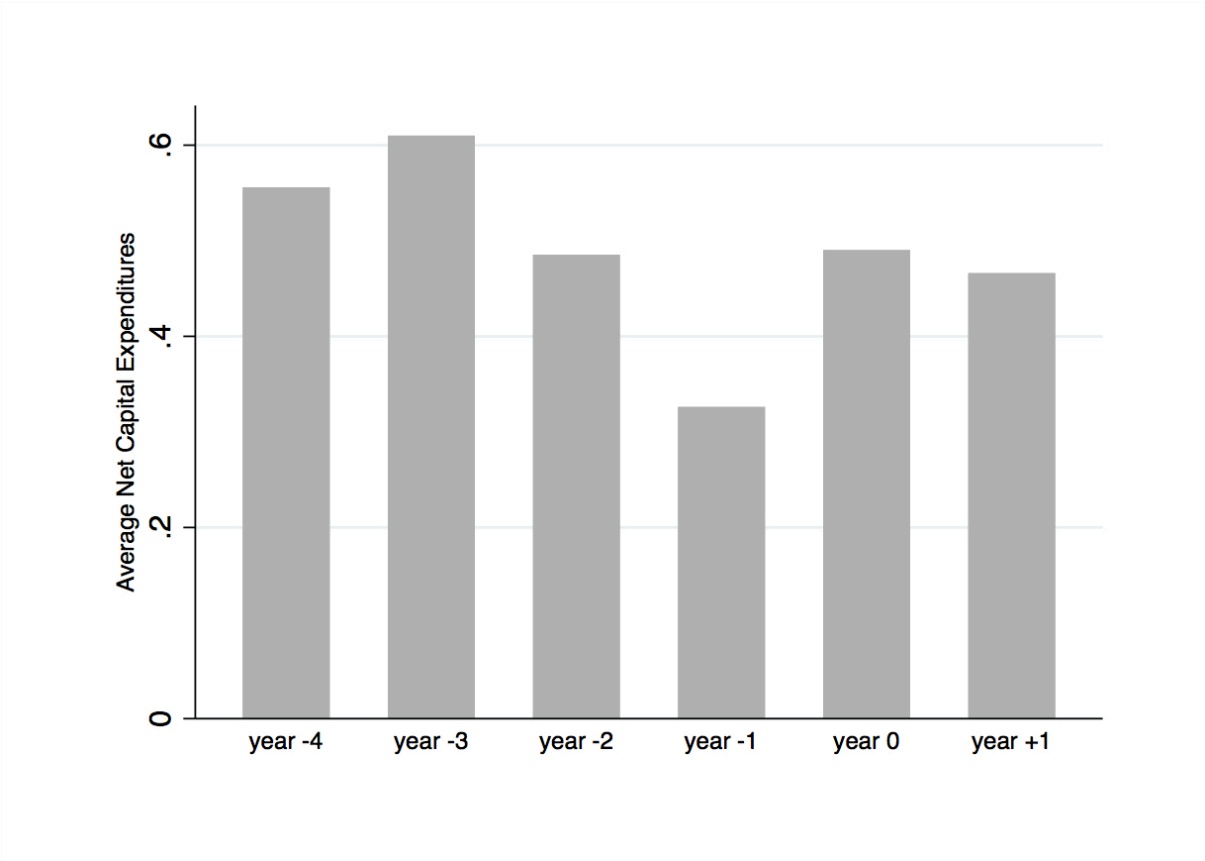
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports the results from our robustness tests. The regressions are based on regression model 2, controlling for two-way fixed effects. The first column from the left presents the variables. The second column from the left shows the results from the including a control indicator variable for if the proportion of independent directors is higher than the industry median. The third column from the left shows the results from the regression run on firms adhering to the industry of industrials. The fourth and the fifth column from the left shows the results from the regression singling our under- and overinvesting firm observations respectively. Note that some of these regressions entail smaller samples due to fewer observations meeting the criteria of the variables. Variable description: $CAPEX$ = net capital expenditures over PPE, $retire$ = 1 for last full year prior to CEO retirement, $CEOsalary$ = natural logarithm of CEO base salary, $CEOSTI$ = natural logarithm of CEO STI, $CEOoption$ = 1 if CEO hold firm options, $CEOshares$ = percentage of firm owned by CEO, $CEOLTI$ = natural logarithm of CEO LTI, $CEOedu$ = takes on value 0-5 depending on education level, $CEOtenure$ = natural logarithm of number of years that the CEO has been in position, $firmage$ = natural logarithm of number of years that firm has existed, ROA = lagged net income divided by two-year lagged total asset value, $size$ = lagged natural logarithm of number of employees, $leverage$= lagged leverage ratio, FCF = lagged natural logarithm free cash flow, $TobinsQ$ = lagged Tobin's Q, IMR = Inverse Mills ratio from first-stage probit regression model, $relay$ = 1 if turnover is conducted through a relay process, $earnbased$ = 1 if CEO STI is based on earnings-based results. New variables created specifically for these regressions: $independent \times retire$ = the effect of independent directors on net capital expenditures in firms with a retiring CEO. Significance levels are based on a one-sided t-test, except for variables $CEOsalary$, $CEOoption$, $CEOshares$, $CEOLTI$, $size$ and IMR.

Figure 1. CEO Behaviour During Different Phases of the Retirement and Theoretical Predictions



Graph 1. Average Net Capital Expenditure in Firms Surrounding Retirement



This graph exhibits the average net capital expenditures in firms where a retirement event takes place. The data label on the x-axis "year-1" is the last full year for a CEO before a retirement event takes place.

Exhibit. 1: Examples of lack of information on options in annual reports

Addnode Annual Report 2017

Problem 1: While Addnode has not issued any options to their CEO, and therefore does not provide any information regarding the value of these options, the biggest shareholder (in the case of Addnode, also the chairman) has issued options as incentives to the CEO and management team. The information of the value of these options are not provided.

Staffan Hanstorp
Född 1957. Styrelseordförande och ordförande i ersättningsutskottet.

Utbildning och erfarenhet: Civilingenjör, Kungliga Tekniska Högskolan. Över 30 års erfarenhet som sälj-, marknadschef och vd inom IT-sektorn. Grundade Technia 1994 som Addnode Group förvärvade 2004. Vd och koncernchef i Addnode Group 2007-2017.

Pågående uppdrag: Styrelseordförande i Byggnadsfirman Viktor Hansson AB och ledamot i IT & Telekomföretagen inom Almega.

Aktieinnehav i Addnode Group: Staffan Hanstorp äger via bolag 50 procent av bolaget Aretro Capital Group AB som innehar 625 332 A-aktier och 1 654 624 B-aktier. Privat äger Staffan 3 973 B-aktier. Aretro Capital Group AB har ställt ut köpoptioner avseende 70 000 B-aktier.

Johan Andersson
Född 1974. Vd och koncernchef för Addnode Group AB.

Utbildning och erfarenhet: Ekonomie magister examen, Uppsala Universitet. Executive Management Program, IFL/Handelshögskolan. Verksam i koncernen sedan 2006 som IR- och M&A-ansvarig samt som CFO. Tidigare erfarenhet som rådgivare på Investment Bank för techbolag vid förvärv och börsintroduktioner.

Pågående uppdrag utanför koncernen: Styrelseordförande i Teknik i Media Datacenter Stockholm AB.

Aktieinnehav i Addnode Group: 57 778 B-aktier och köpoptioner avseende 60 000 B-aktier.

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AKTIESPARPROGRAM, OPTIONS- OCH KONVERTIBELPROGRAM

Addnode Group har inte några utestående aktiesparprogram, options- eller konvertibelprogram.

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Eget kapital

Eget kapital uppgick den 31 december 2017 till 982,5 (964,7) MSEK. Under andra kvartalet har aktieutdelning lämnats med 68,5 MSEK. Förändringar av koncernens eget kapital visas på sidan 49. Några utestående aktiesparprogram, options- eller konvertibelprogram fanns inte den 31 december 2017.

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Assa Abloy Annual Report 2002

Problem 2: Exemplified by Assa Abloy in 2002, they have a convertible bonds programme in place. While they do give fair information about the different types of bonds offered in the

programme, “INCENTIVE 2001”, and the information of the total shares the CEO is eligible for through his convertibles, they do not note which types of bonds (i.e. type 1-4) the CEO has.

In 2001 a new program, INCENTIVE 2001, was launched, based on four series of convertible bonds each totaling EUR 25 M. The only difference between the series of bonds is the conversion price. The program was offered to employees in 16 countries, and 4,500 employees decided to participate. On full conversion, at a conversion price for Bond 1 of EUR 15.8, Bond 2 of EUR 19, Bond 3 of EUR 22.1 and Bond 4 of EUR 25.3, an additional 5,017,432 shares would be created. The convertible bonds can only be converted from October 2006.

p.11

Remunerations and other benefits to senior executives.

SEK M	Salary/ Remuneration	Bonus costs	Pension benefits	Other security	Social costs	Total
The Chairman of the Board	0.5	-	-	-	-	0.5
Other Board members	1.4	-	-	-	0.5	1.9
President	6.6	4.3	4.1	0.1	4.6	19.7
Other senior executives	38.7	23.8	11.1	5.7	7.0	86.3
Total	**47.2**	**28.1**	**15.2**	**5.8**	**12.1**	**108.4**

See Page 76 for senior executives' share and convertible security holdings.

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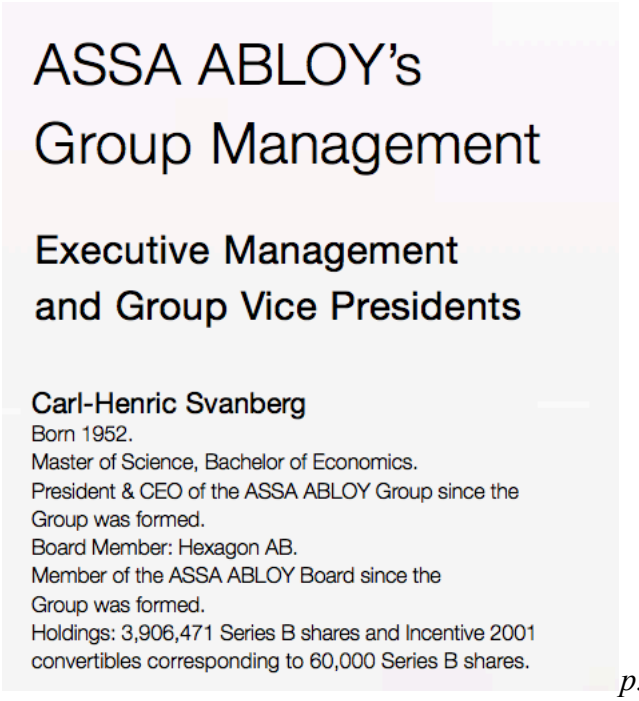

ASSA ABLOY's Group Management

Executive Management and Group Vice Presidents

Carl-Henric Svanberg
Born 1952.
Master of Science, Bachelor of Economics.
President & CEO of the ASSA ABLOY Group since the Group was formed.
Board Member: Hexagon AB.
Member of the ASSA ABLOY Board since the Group was formed.
Holdings: 3,906,471 Series B shares and Incentive 2001 convertibles corresponding to 60,000 Series B shares.

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Note 19 Convertible debenture loans

SEK M	31 Dec. 2002	31 Dec. 2001	31 Dec. 2000
	915.7	1,104.9	250.0

Convertible debenture loan 97/02 had a variable interest rate equivalent to the 12-month STIBOR less 0.25 percent. The loan period was from 8 December 1997 to 2 December 2002. The convertible debenture loan 97/02 could be converted to Series B shares between 1 December 2000 and 15 November 2002. After conversion at a conversion rate of SEK 58.70 there were 3,464,799 new shares added.

INCENTIVE 2001 has a variable interest rate equivalent to 0.9* EURIBOR + 54 basis points. Convertible debenture loans within INCENTIVE 2001 can be converted from October 2006. Full conversion at a conversion rate of EUR 15.80 for Bond 1, of EUR 19.00 for Bond 2, of EUR 22.10 for Bond 3 and of EUR 25.30 for Bond 4 will add 5,017,432 shares. The program has a total value of EUR 100 M.

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Exhibit 2. Breusch-Pagan / Cook-Weisberg tests for the four main regression models

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity in Regression Model 1
Ho: Constant variance
Variables: fitted values of capex_ppe
chi2(1) = 1752.09
Prob > chi2 = 0.0000

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity in Regression Model 2
Ho: Constant variance
Variables: fitted values of capex_ppe
chi2(1) = 1756.82
Prob > chi2 = 0.0000

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity in Regression Model 3
Ho: Constant variance
Variables: fitted values of capex_ppe
chi2(1) = 1758.48

Prob > chi2 = 0.0000

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity in Regression Model 4
Ho: Constant variance
Variables: fitted values of capex_ppe
chi2(1) = 1755.90
Prob > chi2 = 0.0000