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The Hedging Premium

The Value Creating Impact of Corporate Hedging Influenced by Ownership Structures

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Abstract

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Key Words: Risk Management, Hedging, Firm Value, Insider Ownership, Foreign Ownership

Purpose: The purpose of this paper is to investigate the impact of hedging derivatives on firm valuation in present time, as well as the partial effect of different corporate ownership structures affecting the relationship between hedging and firm value.

Methodology: The econometrical approach is based on a random effects model, however also complimented by a fixed effects model. An instrumental variable approach is introduced to deal with endogeneity concerns. Further, to test for the partial effect's interaction terms are introduced. Lastly, we present robustness checks by introducing several regression models clustered on different levels.

Theoretical Perspectives: The theoretical framework of this study is based upon critical assessment of the classical Irrelevance theory. Moreover, the paper introduces several theories of value determinants through hedging activities, such as Hedging Convexity Functions, The Underinvestment Problem, Agency Theories and Enterprise Risk Management.

Empirical Foundation: The study consists of a sample of 297 Swedish non-financial firms listed on the main market in the period of 2017-2021.

Conclusion: This study finds significant evidence of a hedging premium of 15,3% for hedging firms, compared to non-hedging companies. Uniquely and contradicting previous studies made on managerial entrenchment affecting hedging decisions, we find no evidence for management or BoD insider ownership affecting the relationship between hedging and firm value. Instead, we provide evidence of a positive significant relationship between firm value and hedging for firms with higher foreign ownership, indicating that foreign owners increase firm value through enhanced hedging strategies.

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1. Introduction

The introductory chapter of this paper covers the background and origin of this study, including a problem discussion related to the current shortfall of historical academic papers within the examined field of research. Further the purpose and research question are defined, followed by the contribution to the research field and the following structure of the paper.

1.1. Background

In today's highly globalized corporate arena, risk management is critical for all sorts of companies aspiring to become and remain competitive (Oxelheim, Alviniussen and Jankensgård, 2020). Following the classic paradigm of Modigliani and Miller (1958), risk management is allegedly irrelevant to firm value, as well-diversified investors can diversify their private portfolios to meet their own risk preferences. However, easning on the perfect capital market assumptions and acknowledging market friction, there are several corporate financial theories supporting risk management to be value creating for firms. Myers (1977), Smith and Stulz (1985), Bessembinder (1991) all suggest that value is created through derivative usage, as firms reduce their expected costs of financial distress or tax payment, as a result of mitigating underinvestment. Accordingly, whether a *hedging premium* consistently exists or not, remains conflicting within the literature and among successful corporate leaders (see e.g Allayannis and Weston, 2001; Jin and Jorion, 2006).

Moreover, moving away from the traditional hedging premium theories, and instead focusing on the firm individuals formulating and executing the strategies, the variation among firms' derivative policies remain unexplained (Adam, Fernando and Golubeva, 2015). However, the common argumentation of firm value destruction through derivatives typically originates from insider ownership related to managerial entrenchment and self-serving motives from decentralized executive decision-makers (Ogden, Jen and Connor, 2002). Following previous studies on managerial determinants of hedging strategies, the final decision is allegedly in the control of the CEO (Doukas and Mandal, 2018). However, the present corporate climate has accelerated the shift from decentralized risk management systems to an era with more integrated and centrally governed risk systems (Fraser, Quail and Simkins, 2021). As a consequence, the holistic and integrated framework of Enterprise Risk Management (ERM) has become a recognized trend of modern corporate governance reforms and risk management policies, pushing the progress even further (Mikes and Kaplan, 2015). The new trend within

risk management has, among other developments, transferred risk ownership from the decentralized executive management (CEO) and firm individuals towards the centralized perspective of board of directors (BoD) (Jankensgård and Kapstad, 2021). Therefore, acknowledging the new actualization of self-serving incentives, but this time in the perspective of the decision-making BoD, and ultimately the majority owners, sheds light on the importance of ownership structure within the field of hedging and firm value.In contrast to managerial self-serving activities motivated by insider ownership, it is said that foreign owners engage in activities that are value creating for all shareholders (Stulz, 1999). Following the recent trends, the present globalizing development has boosted cross-border trade and capital flows for foreign corporate ownership, creating opportunities for foreign shareholders to invest considerable stakes in non-domestic corporations. Moreover, there is historical evidence suggesting that hedging adds corporate value exclusively for firms with strong internal or strong external governance, originating from dictating ownership structures, (Oxelheim and Randøy, 2003 and Allayannis, Lel and Miller, 2012). Consequently, the current risk ownership transformation in parallel with the boosted globalization and increased capital flows feeding foreign corporate ownership, raises questions within the field of hedging premium. More specifically, the ongoing decision-making shift in risk management, combined with the elements of corporate ownership structure, such as both foreign and insider holdings, may play a vital role in the relationship between hedging and firm value.

1.2. Problem Discussion

The research field of corporations' ability to create excessive value through risk mitigation and utilization of derivatives has thoroughly been researched in the past. The overall picture suggests that the previous literature disagrees upon the notion of hedging premiums being a consistent value determinant. Evaluating the current available studies on hedging premium for non-financial firms the empirical evidence is ambiguous, modest in hedging premiums favor at best (see e.g Allayannis and Weston, 2001; Guay and Kothari, 2003; Bartram, Brown and Conrad, 2011; Allayannis, Lel and Miller, 2012). The weak magnitude of derivative generated cash flows increases the ambiguity of its true impact and questions the validity of the hedging premiums (Guay and Kothari, 2003), whereas others argue that the true magnitude of hedging's premium value creation is during economic downturns (Bartram, Brown and Conrad, 2011). However, few studies have focused on today´s new business climate. With zero policy interest rates and aggressive monetary policies around the leading financial institutes, the market

conditions are unique and provide an opportunity to reevaluate hedging strategies' ability to create consistent excessive value. Therefore, researching a well-developed market in unique conditions both draws upon and complements the research of a consistent hedging premium.

Moreover, in an attempt to investigate this ambiguous academic landscape even further, studies investigating whether hedging is value creating by examine behavioral aspects of managerial attributes, preferences and risk aversion as possible explanatory factors, has emerged during more recent years (see e.g Kumar and Rabinovitch, 2013; Adam, Fernando and Golubeva, 2015; Croci, Del Giudice and Jankensgård, 2017). However, even though some results suggest significant evidence, the very majority of the papers revolve around executive management in general and the CEOs in particular, which creates research gaps that deserve to be addressed. More specifically, hedging's impact on firm value needs to be put in a more present, holistic and integrated risk management perspective, where the risk ownership transfer from CEO to BoD is considered. At present, there seems to be few, if any, academic papers that have investigated hedging derivatives' impact on firm value by taking the perspective of the development of risk management, combined with present globalization of corporate ownership. As companies are transforming their organization and implementing enterprise-wide risk management functions, the previous individual managerial opportunities of entrenchment in organizations should get extinguished, as the risk decision transfers to the BoD. Consequently, this leaves room for further investigation whether the BoDs are, in similar ways as the CEO's, prone to implement strategies based on their individual preferences and engage in speculation. Furthermore, the evolving shift within risk management also enhances the possibilities of the BoD to consequently introduce ownership structures to be more influential. In addition to this, following the aforementioned evidence of the positive relationship of foreign ownership and firm value, we have identified room for further contribution and debt. The insight from Oxelheim and Randøy (2003) and Allayannis, Lel and Miller (2012), where the present globalization of corporate foreign ownership through enhanced monitoring and possible value creation through derivatives combined with above discussion, raises a delicate question. More specifically, if value creation through hedging can be determined and influenced from corporate ownership structure. Consequently, by introducing determinants of external and internal ownership structure in the modern risk management perspective, both uniquely complements and draws upon the current research within the field of derivative usage and value creation.

1.3. Purpose and Research Question

The purpose of this paper is to examine the research topic of corporate derivative usage and its relationship to firm value. More specifically, our ambition is to investigate the relationship between hedging and firm value, to clarify if hedging premium exists in a present, modern and well-developed market. Additionally, in order to fill an identified academic research gap, we aim to explore how discrepancies in ownership structures affect the relationship between market value and hedging. The development of risk management sheds new light on risk management strategies as the empowered transformation increases the BoD decision basis and, in the extension, enhances owners' opportunity to have a greater impact on the daily operations of risk management activities. Moving the modern questions of self-serving entrenchment from the management to the owners and the board room, we use insider ownership (CEO and BoD) and foreign ownership to investigate if there are any stakeholders that determine successful hedging strategies that increase firm value. In order to frame the purpose of this paper, we aim to answer the following main research questions:

Research Question 1. *How does hedging activities affect firm value?*

Research Question 2. *What impact does corporate ownership structure have on the relationship between firm value and hedging?*

1.4. Contributions

Various papers have investigated hedging premium, although few previous studies have investigated the relationship between insider ownership in the perspective of a modern risk management perspective. More specifically, the transferring trend of risk ownership from the CEO´s to the BoD and the effects on risk managing strategies of the present corporate globalization. Moreover, to our knowledge, no other study has explicitly investigated foreign ownership's impact on hedging strategies. Consequently, selecting a modern sample of firms in a well-regulated market in unique conditions contributes a valuable understanding of the development of companies' value creating hedging strategies based on both insider ownership and foreign ownership.

1.5. Structure of the paper

The following part of the empirical paper is structured as follows. Chapter 2 provides the reader with a thorough walk-through of relevant theories within the chosen field of study. Chapter 3 presents previous academic studies regarding the topic, followed by the hypothesis development in the fourth chapter. In Chapter 5, the methodology of the study is presented as well as a description of the sample collection and the data universe of this research. Moreover, Chapter 6 presents the empirical results of the regression models and tests performed, as well as answering the study's hypotheses. In Chapter 7, an analysis of the results is performed in the perspective of previous academic findings combined with aforementioned theories. Chapter 8 summarizes and concludes the study.

2. Theoretical Background

This chapter describes the theoretical framework of this study. Firstly, the fundamentals of the Irrelevance theory are covered, followed by theories related to value creation and behavioral theories of hedging. Finally, the theory of Enterprise Risk Management is presented, in order to support our further analysis and conclusion.

2.1. Irrelevance Theory and Derivative Usage

In a perfect world, the assumptions of capital markets being frictionless, Modigliani and Miller (1958) introduce the irrelevance theory. The theory suggests that companies participating in risk management strategies, e.g., hedging, are non-value creating activities, due to shareholders' possibility of replicating their own preferential portfolio diversification. Consequently, Modigliani and Miller (1958) argue for hedging to be a resource wasteful firm strategy that under perfect capital market conditions, does not yield any alpha for investors. However, assuming market frictions to present, there are several firm value creating reasons for companies to participate in hedging activities.

2.2. Sources of Corporate Value Creation Through Hedging

2.2.1. The Underinvestment Problem

Companies that are financially constrained but have profitable investment opportunities might induce the concept of deadweight cost (Myers, 1977). Having a substantially portion of risky outstanding debt can potentially force companies to use equity as financing tools. This state

transfers the risk and overhang issue to the debt holders, which could potentially force companies to reject profitable investment opportunities due lacking financing options (Myers, 1977). Consequently, utilizing risk management strategies, such as hedging, can be incorporated to mitigate underinvestment situations. Utilized optimally, the purpose is to reduce the volatility of future cash flows and enhance external credibility to creditors, customers and suppliers to improve contracting terms (Bessembinder, 1991).

2.2.2. Tax Convexity Function and Internal Available Funds

The theoretical approach of convex tax functions as incentives for firms to hedge, was originally introduced by Smith and Stultz (1985). The fundamentals of the argumentation can be derived from firms facing convex tax function, whereas hedging utilization reduces the future tax liabilities. Moreover, other cost reducing strategies that come from hedging are increased debt capacity and cheaper financing (see e.g. Froot, Scharfstein and Stein, 1993; Smith and Stultz, 1985). Theoretically, supported by the Pecking Order Theory (Ogden, Jen and Connor, 2002) using internal funds to finance projects is allegedly cheaper than external funds, hence by hedging a firm may reduce its cash flow volatility and ensure that sufficient internal funds are available for investment projects. Additionally, increasing the available debt capacity (Smith and Stultz, 1985)

2.3. Behavioral Theories of Hedging

2.3.1. Agency Theories

In the behavioral perspective of financial theories, personal wealth maximization and preferences have a strong determinant relationship with corporate strategies (Wiseman and Gomez-Meija, 1998). Ogden, Jen and Connor (2002) present management entrenchment and self-serving maximizing objectives as determinants for management utilizing corporate risk mitigation tools. Accordingly, the relationship is enhanced when management personal wealth is determined by the company's performance, as the incentives of reducing the company's earnings variability increases (Ogden, Jen and Connor, 2002). Further, Wiseman and Gomez-Meija (1998) indicate a relationship between current holdings and corporate strategies, implying a causal factor of increasing risk mitigation as insider ownership increases and managing insiders market expectations. In certain cases, the management risk aversion can lead to value destroying activities, as management might have incentive to enhance short term profit maximization and participate in excessive diversification to lock in profitability targets. Hence,

capping upside prospects and potentially reducing the firm value (Oden, Jen and Connor, 2002). The phenomenon of managerial value destruction through risk management tools can be derived from under- and over-management of risk and can arise from individual preferential targeting, from the individuals in position of power (Jankensgård and Kapstad, 2021). Over-management of risk can materialize in situations to defend profit targets that have been achieved, consequently trading-off upside potential to ensure financial targets are met. Moreover, another situation that commonly leads to over-management of risk can be derived from near time disasters. As the probability of the events occurring in near time decreases harshly after the event occurs, to initiate risk mitigating activities often destroy more values than it creates. As to the opposite of over-management, under-management of risk tends to happen when managers are pursuing financial targets. The phenomenon is usually derived from personal preferences and heritage from individuals being overconfident and overestimating their abilities to manage risk. When risk management strategies are utilized by individuals characterized by personal preferences, risk management serves as a value destroying activity rather than value creating. Mitigation of individual preferences can be achieved through strong and interactive governance structure (Jankensgård and Kapstad, 2021).

2.3.2. The Information Problem

If risk management strategies are properly implemented in firms they can serve as a mitigation activity for information asymmetries and the agency costs of free cash flow. The information problem arises from potential information asymmetry between investors and the management, derived from the classic principal-agent relationship (Ogden, Jen and Connor, 2002). If hedging strategies are utilized and disclosed in the financial statements, the activities can act as a mitigation tool, enhancing the information quality and increase value creation by enabling investors to get a clear picture of the projects and the actual profitability (Jankensgård and Kapstad, 2021). Hedging can also serve as a tool for constraining available free cash flows in firms, as managers might have incentives to overinvest or overspend when there is free cash flow available. Introducing hedging strategies in good states and conditions, reduces the free cash flows and prevents managers from overinvesting (Ogden, Jen and Connor, 2002).

2.4. Enterprise Risk Management

Enterprise Risk Management (ERM) is a board-supervised process for integrated risk management across the enterprise (Jankensgård and Kapstad, 2021). The new enterprise wide

perspective of evaluating corporate risk has moved the risk ownership and decision making from firm individuals towards the corporate strategy. Accordingly, embedding risk mitigation activities into the core business and aggregating the net exposures, which are the key elements in the new ERM systems (Fraser, Quail and Simkins, 2021). What differentiates ERM from past corporate risk management structures is mainly pinned down into three clear features. First, it is integrated, meaning a high level of coordination of various risk management activities at the corporate level. Second, it is supervised by the BoD, suggesting an integrated involvement of senior decision-makers that was previously missing. Lastly, ERM is enterprise-wide in scope, referring that the effort of managing risk comprises all business units and corporate functions (Jankensgård and Kapstad, 2021). Consequently, ERM aims to replace the classic silo approach with central governance highlighting risk management, where BoD has the ultimate responsibility and risk ownership. Corporate silos have an inherent tendency to isolate themselves over time, leading to a fragmentation that may cause firm performance and value creation of the overall organization to deteriorate (Jankensgård and Kapstad, 2021). As an answer to this, the new perspective highlights the BoD and other senior executives as policy setters and ultimately the determinants of corporate risk management strategies in a more cross-organizational manner (Fraser, Quail and Simkins, 2021).

3. Previous Empirical Papers

The following chapter aims to relate the theories and approaches presented in the theoretical background to historical empirical papers within the literature of hedging premium. Hedging determinants related to which firms hedge and why firms hedge, as well as how ownership structure could be decisive on the topic is presented, in order to cover the preventive parts for the upcoming hypothesis development.

3.1. Perfect Capital Markets

Hedging and its relationship to firm value is a heavily investigated topic that has been thoroughly reviewed by academic researchers. Following Modigliani and Miller (1958) assumptions of perfect capital markets, risk management activities should pose a negative relationship with firm value. However, exploiting the assumptions and acknowledging frictions as being present, there are several reasons for firms to actively use risk management tools.

3.2. Hedging Premium

The direct impact of hedging on firm value is a widely researched relationship. However, the ambiguous empirical evidence still maintains relevance to the topic and keeps researchers evaluating the consistent existence of hedging premium and why some firms successfully acquire it. Allayannis and Weston (2001) uses a large sample of 720 US non-financial firms in the time period of 1990-1995. They find currency hedging to significantly increase a firm's market value, deriving their conclusion from reduced volatility in cash flows from foreign currencies to reward their sample companies with an average hedging premium of 4,9%, relative to non-hedgers. Furthermore, Bartram, Brown and Conrad (2011) finds supporting evidence of hedging premium using a large international sample of non-financial firms for 47 different countries. Their evidence suggests that the valuation premium obtained from hedging is acquired from the ability of reducing risk and performing larger profits during economic volatile downturns. Alike, Guy and Kothari (2003) found aligning evidence consistent with previous authors for an existing hedging premium for 234 large non-financial firms in the US. However, their results indicate that the financial impact of hedging on non-financial firms is at best modest, in relation to firm size and operating cash flows. For industry specific studies, Mackay and Moeller (2007) finds supporting evidence from the oil industry, using a sample of 34 oil refiners analyzed from 1985-2004. Their empirical results indicate that there is a hedging premium of 2-3% that can be derived from non-linearity costs, suggesting that risk management activities that reduce the future cash flow volatility creates excess firm value. Similarly, Carter, Rogers and Simkins (2006) find evidence supporting hedging as a value creating activity for capturing growth opportunities in the US airline sector. Their empirical evidence suggests that there is a Jet Fuel hedging premium as large as 5-10% for US airlines. Their motivation for the large valuation premium is derived from acquired mitigation of the high volatility in jet fuel prices. Moreover, Jin and Jorion (2006) also focus on industry specific hedging companies. However, in their study including US oil and gas companies, their results suggest that there is no evidence for hedging premium in the US oil and gas industry. Nonetheless, they find evidence that supports hedging to reduce cash flow volatility, as the stock performances had reduced correlation with commodity prices (Jin and Jorion, 2006). Consequently, in contrast to Carter, Rogers and Simkins (2006), their sample firms are not rewarded with a valuation premium for the reduced variability. In more recent studies, Jankensgård (2015) evaluates hedging premium based on centralized risk management control, using a sample of Swedish non-financial firms. The results indicate a hedging premium of

about 15% for centralized foreign exchange (FX) governed firms, compared to decentralized FX governed firms. For the decentralized FX firms, no hedging premium was attached to the valuation, compared to non-hedgers. The interpretation of the results is suggested to be affected by increasing agency costs and higher potential for individuals to entrench self-serving activities (Jankensgård, 2015).

3.3. Hedging Determinants

3.3.1. Corporate Characteristics

Corporate financial determinants of hedging are frequently explained as incentives for reducing cash flow variability, future tax liabilities, financial cost of distress and mitigating underinvestment. Easing on the Modigliani and Miller (1958) assumption of perfect capital market presence, hedging activities can create value through ensuring internal financing. Froot, Scharfstein and Stein (1993) propose optimal hedging value creation as reduction of cash flow variability to establish internal financing for profitable investments opportunities. Furthermore, Bessembinder (1991) introduces incentive mitigations for underinvestment through hedging activities. The findings are supported by several studies (see e.g. Gay and Nam, 1998; Carter, Rogers and Simkins, 2006; Aretz and Bartram, 2010). Gay and Nam (1998) have a sample of non-financial firms operating in the US. Their study focuses on the relationship between growth opportunities and derivatives usage. The results suggest that there is a significant positive relationship between firms using derivatives and capturing growth opportunities. Tax benefits are derived from e.g Smith and Stultz (1985); Graham and Smith (1999) who introduces the convex tax function, where optimal hedging activities reduce future tax liabilities. Empirically, Nance, Smith and Smithson (1993) support the proposition of a convex tax function, using a comparative study of 104 firms applying hedging instruments compared to 65 firms not using any instrument. Their results suggest that firms employing hedging instruments reduce their future tax liabilities by benefiting from convex tax functions. Moreover, the authors also found evidence that larger firms have greater incentive to interact in hedging, which is explained by large start-up costs and the need for qualified expertise (Nance, Smith and Smithson, 1993). The results are similar to the evidence from Smith and Stultz (1984) regarding the fact that larger firms become more inclined to employ managers with hedging experience, who can maintain and manage a hedging program.

3.3.2. Managerial Incentives

In strategies, policies and execution of risk management there are a variety of different explanatory variables that yield interesting motivations. One of the more classic determinants is developed by Smith and Stulz (1985). The authors introduce management entrenchment, personal preferences and private profit maximization as incentives for risk management selection. Originally, the theoretical framework is derived from Modigliani and Miller (1958) argumentation, where Smith and Stulz (1985) implies poor personal diversification as a managerial tool to mitigate personal risk aversion. A study by Tufano (1996) finds supporting evidence from the gold mining industry that derives CEO insider ownership as a significant attribute for being inclined to utilize derivatives for commodity price fluctuations. Further, more present studies in the topic from i.e. Kumar and Rabinovitch (2013) extends the comprehensiveness by introducing several significant results related to management entrenchment and selection of risk management strategies, for the US oil and Gas industry using a sample from 1996-2008. Their results suggest that more weakly governed companies have a greater possibility of hedging according to managerial preferences. Moreover, on the topic of managerial preferences affecting the risk management strategies, Croci, Del Giudice and Jankensgård (2017) continues the investigation of US oil and gas companies between 2000 and 2013. The authors conclude that CEO preferences have a significant impact on the selection of risk management strategies in companies, hedging exposure and derivative structuring. Similarly, Adam, Fernando and Golubeva (2015) observe evidence of managerial overconfidence as a determinant of hedging strategies for future hedging decisions. Their sample of 92 gold mining firms from 1989-1999 provide significant results for management engaging in speculative hedging after profitable hedging executions appearing in previous quarters. The asymmetric relationship emerging from no reduction in unprofitable periods is being concluded as evidential managerial overconfidence which provides significant evidence for risk management being affected by managerial preferences (Adam, Fernando and Golubeva, 2015).

3.4. Foreign Ownership and Hedging

Foreign ownership in firms is generally considered to have a positive influence on firm value. Commonly, attracting foreign investors can be seen as a positive signaling effect (Oxelheim and Randøy, 2003). Moreover, in a study of 253 publicly traded Swedish and Norwegian firms, Oxelheim and Randøy (2003) found significant evidence that Anglo-American board structures

originating from foreign ownership have a positive impact on firm value. The author's main explanatory determinants are derived from an enhanced corporate governance system and improved reputational legitimacy in financial markets (Oxelheim and Randøy, 2003). Furthermore, Stulz (1999) introduces foreign board members to interact in activities that are value creating for all shareholders. This can be seen as the opposite of aforementioned previous theoretical and empirical discussions of management entrenchments. Hence, inviting to an investigation if higher foreign insider ownership enhances firm value and enforce risk management strategies that are overall value creating. Moreover, Stulz (1999) argues that the value creation from foreign ownership is inherited from the quality development of corporate governance, due to increasing requirements from foreign investors. In other studies, Allayannis, Lel and Miller (2012) find significant evidence for value premiums acquired from hedging strategies, for their international sample of 372 non-financial. Their results imply that there is a relationship between value premium acquired from hedging activities inference with the level of governance and foreign ownership, both at a company specific level but also at the country level. Consequently, implying that stronger governance is rewarded with higher hedging premiums and weak governance yield insignificant hedging strategies (Allayannis, Lel and Miller, 2012).

4. Hypothesis Development

Presently, there are substantial empirical research in the hedging premium literature investigating the notion of hedging activities effect on firm value (see e.g. Allayannis and Weston, 2001; Guay and Kothari, 2003; Jin and Jorion 2006; Carter et al, 2006; Bartram, Brown and Conrad, 2011). Accordingly, the ambiguous and modest empirical results attributed to hedging premium, invites for further investigation and clarification of its consistency over time. The critics' emphasis on hedging's modest magnitude in non-financial firms and suggest that its true excessive value creation occurs only in economic downturns (Guay and Kothari, 2003; Bartram, Brown and Conrad, 2011), whereas today's unique market conditions provide an opportunity to reevaluate hedging strategies' ability to create consistent excessive value. Consequently, our first research question of the study is to investigate the relationship between hedging and firm value, captured by Tobin´s Q. Based on previous research of non-financial firms from i.e Allayannis and Weston, 2001; Allayannis, Lel and Miller, 2012, we expect that there is a positive valuation premium rewarded for hedging firms.

Hypothesis 1: *Hedging activities has a positive relationship on firm value (Tobin´s Q).*

Secondly, assuming that there exists a hedging premium, we are interested in investigating the interaction between insider ownership structures and hedging's value creation effect. Following previous studies of managerial hedging determinants from i.e Smith and Stulz, (1985); Tufano, (1996); Kumar and Rabinovitch, (2013), there is supporting evidence of personal preferences and risk aversion connected to insider ownership and hedging selection strategies. However, previous studies are mostly focusing on CEO determinants for hedging, where we argue that the risk management ownership and strategic guidelines in companies have shifted as the trend of Enterprise Risk Management has rapidly become the new normal praxis. Consequently, our unique approach is to shift the focus towards BoD ownership and their incentives to formulate a risk management strategy that satisfies their personal preferences. By selecting a sample of Swedish companies from 2017-2021, we hope to contribute by capturing the changes in risk management in a high-developed corporate market within risk management. For our hypothesis development, we base it on the theoretical framework of executive management exercising entrenching activities to meet their personal risk preferences and accordingly use the companies risk mitigation tools for self-serving purposes (Ogden, Jen and Connor (2002). Consequently, we expect firm value to decrease when we interact hedging and insider ownership.

Hypothesis 2.1: *The relationship between hedging and firm value (Tobin's Q) is negatively affected by higher CEO insider ownership.*

Hypothesis 2.2: *The relationship between hedging and firm value (Tobin's Q) is negatively affected by higher BoD insider ownership.*

For the final hypothesis development, we have gained inspiration from Oxelheim and Randøy (2003) empirical results, providing a significant relationship between foreign ownership and firm value. Consequently, we introduce a unique perspective of investigating how foreign ownership interacted with hedging affects the value of the firm. For our hypothesis development we expect a positive interaction term between foriegn ownership and hedging, supported by Stulz (1999) approach. Contrary to previous theoretical presented approaches of managerial entrenchment, Stulz (1999) introduces a different perspective for foreign

ownership, where the argument is that foreign ownership has incentives to interact with activities that are value creating for all shareholders, as a result of increased governance quality.

Hypothesis 3: *The relationship between hedging and firm value (Tobin's Q) is positively affected by higher foreign ownership.*

5. Methodology

The following chapter starts by introducing the paper's scientific approach, followed by the econometric methodology. Additionally, the sample universe is explained, delimitations of the study described, as well as an in-depth presentation and definition of the variables used in this research.

5.1. Introduction and Scientific Approach

In line with the majority of historical papers within the field (Carter, Rogers and Simkins, 2006; Jin and Jorion 2006; Allayannis et al., 2012; Jankensgård 2015), this study's research design will be based upon a deductive theoretical approach combined with quantitative methodology, in order to investigate the impact of corporate value creation from hedging activities dependent on the structure of insider ownership. By using this process, we will translate deduced hypotheses and then translate the findings into operational terms and interpretations (Bell, Bryman and Harley 2019). The scientific and methodological technique for this paper can be depicted as a six-step series, as outlined in Figure 1.

Figure 1: The process of deduction; Source: Bryman, Bell and Harley (2019, p.21)

Firstly, we conducted a thorough review assessment of historical empirical papers and the theoretical landscape of hedging and corporate risk management. This procedure was followed by a hypothesis development. The hypotheses presented and tested in this study were developed by analyzing our theoretical framework. The analysis disclosed deficient influence of corporate characteristics in general and insider ownership structure in particular as possible explanatory components in the relationship between hedging and firm value, which functions as a fundament in the forming of our hypotheses. Theoretical analysis and hypothesis

development further drive the process of gathering data and the procedure where we identify the course of actions needed to investigate the desired research question. When collected, modeled and hypothetically tested, our scientific methodology terminates in a theoretical revision and conclusion.

5.2. Econometric Methodology

For selecting a suitable econometric approach for our hypothesis testing, there are several conventional methods that are frequently adopted for testing panel data. Our aim is to investigate whether hedging is a value creating corporate activity, followed by analyzing the hedging firm's ownership structure effect on firm value in various constellations. Previous acknowledge research that has investigated hedging interaction determinants explanatory effect on firm value has approached the econometric methodology using pooled ordinary least square (OLS), random effects models and fixed effects models (Carter et al., 2006; Jin and Jorion 2006; Allayannis et al., 2012; Jankensgård 2015). This study will mainly focus on using the random effects model for testing all presented hypotheses. However, we will also introduce fixed effects models to enhance the robustness of some of the hypotheses. The motivation of model selection will be thoroughly analyzed and discussed in the section below. Moreover, we also introduce an instrumental variable approach for our hedging variable to deal with the issues of endogeneity. For this study's second and third hypothesis, we cultivate our hedging firms by introducing interaction terms between hedging and various ownership structures, as an attempt to apprehend how insider ownership and ownership structure affects risk management strategies and ultimately the firm value.

5.3. Econometric Models

Considering an approach using a pooled-OLS model ignores the panel data structure. Econometrically, the observations in the sample are pooled across groups, or time, estimating the coefficients cross-sectional. Further, for the purpose of capturing different distributions in our sample, the pooled-OLS regression model allows for the intercept to change across periods by introducing dummy variables as yearly effects (Wooldridge, 2016). However, using pooled-OLS models introduces estimators that may be biased and inconsistent due to the fundamental assumptions of uncorrelated x_{it} with the unobserved effect a_i. This heterogeneity bias emerges from the time constant variable being omitted and may cause a biased estimation of the dependent variable. If we introduce a simple pooled-OLS regression model:

$$y_{it} = \beta_0 + \beta_1 x_{it} + \alpha_i + \mu_{it}$$

The unobserved factors that potentially give rise to the heterogeneity bias emerges from a_i, where u_{it} is the idiosyncratic time-varying error term affecting our dependent variable y_{it}. Further, $_i$ describe the data unit and $_t$ is the period measurement (Wooldridge, 2016). Consequently, returning to the origin of critique regarding pooled OLS models, we arrive at the assumption of no correlation between the unobserved effect and our observations for the model to hold its validity, otherwise producing biased estimators that are experiencing heterogeneity bias (Wooldridge, 2016). To manage for heterogeneity bias, the possibility of introducing a fixed effects model is an option. Compared to the unobserved effects model introduced above, a fixed effect model deploys an arbitrary correlation in the relationship between our explanatory variables and the a_i. Accordingly, the fixed effects model offers a transformation where the constant explanatory variables for all units $_i$ are omitted, as all-time invariant x_{it} in the sample that equals to zero after the transformation, is swept away (Wooldridge, 2016). Furthermore, another well acquaintance estimation bias can occur when there is no time variability in the explanatory variables. The objective is to separate the effect from a_i and the dependent variable, from the explanatory variables. In a scenario where the explanatory variable is constant over time, the assumption is not possible to fulfill and may affect the coefficient estimations by increasing the standard errors (Wooldridge, 2016). Introducing a random effects model, we reject the attempts to eliminate a_i and instead assume it to be uncorrelated with our explanatory variables for each time period. Additionally, the random effects allow for explanatory variables to have none, or little time variation, in contrast to the fixed effects model.

For this study one of our main explanatory variables, the hedging dummy, has little, or no time-variability. Wherefore using a fixed effect model is not applicable for our main regression models, due to the transformation omitting the hedging variable. As companies tend to consistently follow their risk management strategies and hedging activities, the variation is close to none. However, to not fully reject the possibility to deal with endogeneity concerns we also introduce a regression using fixed effects by collecting hedging data as a continuous variable, nonetheless due to the complexity of data collection and sample reduction, the fixed effects model will mainly be used as a robustness enhancer. Consequently, we arrive at the selection between pooled-OLS and random effects models, where the obvious issue of one of

our main explanatory variables, the hedging dummy, being constant, or having little time variation suggests that pooled-OLS might be inefficient due to presence of autocorrelation. The random effects model uses the general least squares (GLS), mitigating any serial correlation that might occur in the composite error term. Compared to a pooled-OLS that mistreats the serial correlation, causing presence of higher standard errors and possibility of incorrect t-statics. Following Wooldridge (2016) proposition, if the assumption of heterogeneity is assumed to be restricted to the composite error term and relevant control variables are properly introduced to the model, the random effects model can be seen as a more efficient estimator compared to pooled-OLS. Consequently, this motivates the introduction of yearly and industrial control effects for the purpose of capturing industrial and cyclical variations in our random effects model (Wooldridge, 2016).

<u>Pooled-OLS (Hypothesis 1)</u>

$$Tobin's\ Q\ (log)_{\ i,t} = \beta_0 + \beta_1 Hedging_{i,t} + \beta_2 Total\ Assets\ (log)_{\ i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales_{i,t} + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 CEO\ Ownership_{i,t} + \beta_9 BoD\ Ownership_{i,t} + \beta_{10} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \epsilon_t \quad (1)$$

<u>Random Effects – Base Model (Hypothesis 1)</u>

$$Tobin's\ Q\ (log)_{\ i,t} = \beta_0 + \beta_1 Hedging_{i,t} + \beta_2 Total\ Assets\ (log)_{\ i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales_{i,t} + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 CEO\ Ownership_{i,t} + \beta_9 BoD\ Ownership_{i,t} + \beta_{10} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t \quad (2)$$

<u>Fixed Effects – Continuous Hedging Variable (Hypothesis 1)</u>

$$Tobin's\ Q\ (log)_{\ i,t} = \beta_0 + \beta_1 Hedge\ Ratio_{i,t} + \beta_2 Total\ Assets\ (log)_{\ i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales_{i,t} + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 CEO\ Ownership_{i,t} + \beta_9 BoD\ Ownership_{i,t} + \beta_{10} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \delta_t \quad (7)$$

5.3.1. The Instrumental Approach and Endogeneity Mitigation

Previous studies in the topic have established that there are concerns with heading variables being endogenous. Both within the model, but also the potential issue of emerging reverse causality in the relationship with Tobin´s Q (See e.g. Allayannis and Weston, 2001; Bartram, Brown and Conrad, 2011). Firstly, we encounter the issue of hedging lacking independence on a firm level, as hedging activities tend to be correlated on a yearly basis (Bartram, Brown and Conrad, 2011). However, this is somewhat expected due to the fact that hedging is associated with large start-up costs as well as the activities being embedded into corporate policies, making the year on year variability static. Secondly, a hedging decision is an active choice that

is derived from specific characteristics and expected potential benefits. Consequently, the decision can be evaluated non-randomly and may be influenced by firm characteristics that are correlated with firm value (Allayannis and Weston, 2001; Bartram, Brown and Conrad, 2011). A way to deal with endogeneity is to introduce an instrumental variable (IV) approach, following a two stage least square regression (2SLS) (Wooldridge, 2016). Using an IV and following the 2SLS approach includes a proxy that acknowledges if there is any presence of omitted variables and mitigates the concerns of unobserved effects. To fulfill the criteria of being an appropriate IV, the requirements that need to be satisfied are firstly strong, but not perfectly, correlation between the IV and the explanatory variable, and secondly, no correlation between the dependent variable and the IV (Wooldridge, 2016). Accordingly, the first step of the 2SLS regression is to regress the endogenous variable on all exogenous variables, including introduction of the IV to fulfill the first criteria of eligibility of being considered relevant as a valid IV, through significance test. Furthermore, the IV replaces the endogenous variable with the estimated predicted values from the first stage regression joint with the control variables to regress the new predicted value of the dependent variable (Roberts and Whited, 2013).

Previous studies in the topic have selected different methods of treating endogenous variables. One commonly used approach is to focus the study on one industry, in order to remove sample selection bias (see e.g. Jin and Jorion, 2006; Jankensgård, 2015). Further, Bartram, Brown and Conrad (2011) introduces a propensity matching score, matching derivative users, with non-users to establish an exogenous incentive. However, the most commonly used method is the instrumental approach (see e.g. Campello et al. 2011; Allayannis, Lel and Miller, 2012).

To deal with the potential endogeneity issues we introduce several instrumental variables for hedging. Firstly, we follow Bartram, Brown and Conrad (2011) and Allayannis, Lel and Miller (2012) methodology of creating an instrumental variable that is based on the average frequency of firms heading in a sector and in industries on a yearly basis. Reasonably we expect there to be a correlation between the average industrial/sector hedgers and firms hedging, satisfying the relevance eligibility criteria presented by Wooldridge (2016). Moreover, by using the industry/sector level we establish an eligible exogenous relationship towards or dependent variable, Tobin´s Q. Our second approach is inspired by Croci, Del Giudice and Jankensgård (2017) that uses CEO compensation to test for hedging behavior. Modifying the variable accordingly to our previous discussion, we introduce BoD compensation as a possible instrumental variable for hedging decisions. Following the theoretical rationale of Smith and

Stulz (1985), the director's sensitivity to change in firm value suggests that there is a relationship between hedging decisions and compensation schemes, which motivates our selection of instruments based on relevance. Moreover, as the theoretical approach of incentives packages tied to firm performance is usually introduced to executive management (Parthasarathy, Menon, Bhattacherjee, 2006), while board-tied performance compensation usually is based on equity arrangement, for the purpose of increasing the incentives of acting in shareholders' best interest (Ertugrul and Hegde, 2008). Accordingly, the recorded BoD compensation used in our sample should not have any direct effect on the firm value, as the nature of it is fixed. Consequently, BoD compensation satisfies the eligibility of exogeneity towards the independent variable.

<u>First-Stage Least Square Estimation (Hypothesis 1)</u>

$$Hedging_{i,t} = \beta_0 + \beta_1 BoD\ Compensation\ (log)_{i,t} + \beta_2 Total\ Assets\ (log)_{i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales_{i,t} + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 CEO\ Ownership_{i,t} + \beta_9 BoD\ Ownership_{i,t} + \beta_{10} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \epsilon_t \quad (3a)$$

<u>2SLS-Estimation with Random Effects (Hypothesis 1)</u>

$$Tobin's\ Q\ (log)_{i,t} = \beta_0 + \beta_1 \widehat{Hedging}_{i,t} + \beta_2 Total\ Assets\ (log)_{i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales_{i,t} + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 CEO\ Ownership_{i,t} + \beta_9 BoD\ Ownership_{i,t} + \beta_{10} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t \quad (3b)$$

5.3.2. Interaction Terms

For our second and third hypotheses our study's approach is to investigate the relationship of hedging firms interacting with insider ownership to test for significant determinants of firm value. Accordingly, we introduce interaction terms to capture the partial effect of an explanatory variable when interacted with a second explanatory variable. Consequently, to measure the partial effect on the dependent variable (Wooldridge, 2016). For hypothesis testing of Hypothesis 2.1., 2.2. and 3 we establish an interaction term combining hedging firms and insider ownership. Divided into subcategories of BoD, CEO and total foreign ownership dependent on if firms hedge or not.

Random Effects – CEO Ownership x Hedging Model (Hypothesis 2.1.)

$$Tobin's\ Q\ (log)_{\ i,t} = \beta_0 + \beta_1 Hedging \times CEO\ Ownership_{i,t} + \beta_2 Total\ Assets\ (log)_{\ i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 Hedging_{i,t} + \beta_9 CEO\ Ownership_{i,t} + \beta_{10} BoD\ Ownership_{i,t} + \beta_{11} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t \quad (9)$$

Random Effects – BoD Ownership x Hedging Model (Hypothesis 2.2.)

$$Tobin's\ Q\ (log)_{\ i,t} = \beta_0 + \beta_1 Hedging \times BoD\ Ownership_{i,t} + \beta_2 Total\ Assets\ (log)_{\ i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 Hedging_{i,t} + \beta_9 CEO\ Ownership_{i,t} + \beta_{10} BoD\ Ownership_{i,t} + \beta_{11} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t \quad (11)$$

Random Effects – Foreign Ownership x Hedging Model (Hypothesis 3)

$$Tobin's\ Q\ (log)_{\ i,t} = \beta_0 + \beta_1 Hedging \times Foreign\ Ownership_{i,t} + \beta_2 Total\ Assets\ (log)_{\ i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 Hedging_{i,t} + \beta_9 CEO\ Ownership_{i,t} + \beta_{10} BoD\ Ownership_{i,t} + \beta_{11} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t \quad (13)$$

5.4. The Data Universe

5.4.1. Sample Selection and Data Collection

For this study, the sample universe is exclusively represented by publicly traded non-financial firms on the Swedish main markets Large cap, Mid cap and Small cap during the five-year time period between 2017 and 2021. The sample group together with all firm specific accounting data was exclusively collected using Thomson Reuters Eikon. Consequently, the data query resulted in a sample of 377 listed entities. Moreover, out of the original sample, 38 firms were withdrawn since they are TRBC classified as financial entities. Financial companies could be considered as market makers in terms of derivatives (Jankensgård, 2015). Hence, the purpose for financial firms in derivative usage could differ significantly from non-financial firms. Additionally, 42 companies were excluded due to lack of sufficient quality data. The majority of these withdrawn firms can be derived from non-available market capitalization data due to delisting. Thus, giving us insufficient accounting data that is required for the calculation of our dependent variable, Tobin's Q. Furthermore, as our sample companies were selected based on available ownership data we acknowledged that Holdings include privately traded companies in the sample, contributing to the count of non-eligible firms. Consequently, given the dropped firms, the final sample used in this study consists of 297 eligible firms resulting in 1403 firm-year observations. Out of the final sample, 166 companies were classified as hedging firms. An overview of the sample universe including an industrial breakdown is presented in Table 1.

Table 1: Sample Summary

Sample		Number of firms
Total listed firms		377
Financial firms		38
Lack of data firms		42
Final sample		297
Hedging firms		166
Non-hedging firms		131
Currency hedging firms		120
Interest rate hedging firms		98
Commodity hedging firms		27
Industry	**Final sample**	**Hedging firms**
Academic & Educational Services	3 (1%)	0 (0%)
Basic Materials	17 (6%)	14 (8%)
Consumer Cyclicals	44 (15%)	26 (16%)
Consumer Non-Cyclicals	10 (3%)	8 (5%)
Energy	4 (1%)	4 (2%)
Healthcare	58 (20%)	17 (10%)
Industrials	72 (24%)	41 (25%)
Real Estate	35 (12%)	34 (20%)
Technology	53 (18%)	21 (13%)
Utilities	1 (0,3%)	1 (1%)
Total	297 (100%)	166 (100%)

Note: The table displays an overview of this study's sample universe. Further, an illustration of the methodology going from the original total population, through withdrawals of firms, to our final eligible sample is presented. Moreover, the table also breaks down the final sample into industry categories using Thomson Reuters defined TRBC industry classification.

The variable data gathering related to hedging were manually collected from the annual reports of all firms during the studied time period. The continuous variable for hedge ratio in this paper was collected by a uniquely composed online survey. By using this technique, we are able to use exclusive data and enhance the uniqueness and deepness of this study (Bell, Bryman and Harley, 2019). The survey was digitally handed out with a consensus attempt in order to collect data from all 166 observed hedging firms of the final sample group. Moreover, other than collecting the pre-defined hedge ratio from answering firms, we also asked the respondent who their risk management policy makers are. The summarized answers showed that in 97,1% of the cases, the BoD is the decision maker.

Nevertheless, due to issues related to the low-response problem for online research methodologies (Bell, Bryman and Harley, 2019), only 35 (23%) companies participated in the survey, resulting in 823 original firm-year observations for the hedge ratio variable when combined with non-hedging companies. Consequently, in order to raise the data quantity and enhance the quality of the variable hedge ratio, additional data from 14 firms were manually collected from annual reports from firms, with the criteria of clear disclosure of the hedge ratio,

as can been seen in Appendix B. Moreover, we compared sample-checks of the survey collected hedge ratios with our manually collected method, in order to examine the validity of our manually collected variables. Insightfully, we found out that few companies disclose their hedge ratios in their annual reports, which to some extent, obstructs the robustness check of the method and variable. However, of those firms who disclosed their defined hedge ratios, we were partly able to justify the continuous variable for hedge ratio. For example, of disclosed hedge ratios, see Appendix B. After the manual completion of the hedge ratio variable, the final data resulted in a total of 893 firm-year observations. Nonetheless, due to the deficiencies in respondents and data collection the replicability, validity and concluding quality for the variable hedge ratio is clearly weakened. Conclusively, we acknowledge that the sample representativeness might be skewed and we take a careful approach when interpreting the results.

5.3.3. Sample Representativeness

In order to execute valid analyses and draw correct conclusions, an accurate sample representativeness of publicly traded Swedish hedging firm's characteristics and ownership structure is vital (Bell, Bryman and Harley, 2019). By using the main publicly traded Swedish markets Large cap, Mid cap and Small cap, we ensure and enhance data transparency and validity of our sample firms. Moreover, by observing Table 1, we can identify a well distributed sample in terms of hedging firms relative to non-hedging firms as well as a widely spread sample between the industries. However, the relatively narrow time period could be a source of risks where firm characteristics and hedging strategies become victims for time frame bias. Nevertheless, due to the scope and approach of this study where the shift from management to board perspective in hedging policy constitution is present, the current time frame could be argued as valid. Therefore, it is valid to view our sample group as sufficient in terms of representativeness for examining hedging's value impact on Swedish firms relative to its company characteristics and ownership structure.

5.3.4. Systematic Errors

For the accounting data, Thomson Reuters Eikon database uses a normalized execution of data gathering and classification for all firms. This arouses the possibility of systematic errors and misleading generalized values for various accounting data. Further, the fact that we have included companies that have been listed as well as delisted during the selected time period generates sample firms that do not contain data for all observed years. This creates an unbalance

in our panel data which could be considered as negative for this paper's results and further drawn conclusions. Moreover, since the critical main explanatory dummy variables were collected manually for all companies and years arouses the possibility of systematic errors in the classification of hedging firms. However, due to the fact that this paper follows the systematic classification approach for hedging firms as previously recognized papers in the field (see e.g. Fauver and Naranjo, 2010; Allayannis and Miller, 2012; Jankensgård, 2015; Croci, Del Giudice and Jankensgård 2017), we curb and mitigate the risk for large-scale errors in our panel data. For specification of the classification, see section *5.4.1. Dependent Variable*.

5.3.5. Sample Delimitations

As a consequence of this study's specific geographical scope combined with a limited time frame of analysis, certain further delimitations needed to be done. First and foremost, the study mainly focuses on derivatives related to interest rate and foreign exchange exposure. Commodity derivatives were observed and included in the sample collection of hedging companies. However, due to the low representativeness, an exclusive commodity derivative variable was excluded from a further regression analysis. Further, derivatives used for speculation will not be considered, since their characteristics are not to mitigate fluctuations and stabilize corporate performance. Moreover, due to accounting transparency and hedging data collection issues, this study is only observing publicly traded firms on the Swedish main markets. Hence, companies traded on public markets such as NGM Nordic, Spotlight Stockmarket and Nasdaq First North were excluded.

5.4. Variable Descriptions

5.4.1. Dependent Variable

Firm Value Measurement:

Since the overall objective of this thesis is to evaluate the determinants of hedging activities impact on firm value, we endeavor to capture the best practice proxy. Following previously acknowledged literature in the topic, common practice is to proxy firm value using Tobin´s Q (see e.g. Allayannis and Weston, 2001, Carter, Rogers and Simkins, 2006; Mackay and Moeller, 2007; Jankensgård, 2015). Tobin´s Q is calculated as a ratio, in the numerator: Total book value of assets, subtracted by total book value of equity and adding the market value of equity. In the denominator the ratio is calculated by using the total book value of assets. However, the validity of Tobin's Q as a proxy of firm value, even though it's the generally most frequently used measurement, is somewhat questioned for its varying significance (Fu, Singhal

and Parkash, 2016). To prevent skewness and possible econometrics complications, we follow (e.g. Allayannis and Weston, 2001; Carter et al., 2006; Jankensgård, 2015) commonly used method and use the natural logarithmic of the variable in order to enhance normality distribution.

5.4.2. Explanatory Variables

Hedging Measurements:

For capturing companies that use financial derivatives to hedge their risks there are several methods to construct a variable. One commonly used method in previous literature (see e.g Fauver and Naranjo, 2010; Allayannis, Lel and Miller, 2012; Jankensgård, 2015; Croci, Del Giudice and Jankensgård 2017) is to take the binary approach and create a dummy variable for firms using derivatives for hedging purposes. For this study, we define a company as a hedging firm if one or both of the two following conditions is true: 1) hedging derivative instruments are shown in the cash flow statement, or 2) the firm clearly states that hedging is part of their main operating strategy for the current fiscal year. Furthermore, we also structure the derivatives into three subcategories based on the hedged risk, specified into interest rate derivatives, currency derivatives and commodity derivatives which are the three risks that Swedish non-financial firms use derivatives to hedge against. However, we also recognize the imperfections of using a dummy approach for one of our main explanatory variables. Consequently, to enhance the accuracy of the study we also introduce a continuous variable for the derivative hedging position, the hedge ratio, which is commonly used in previous studies (see e.g. Graham, and Rogers, 2000; Guay and Kothari, 2003; Adam and Fernando, 2006; Jin and Jorion, 2006) The hedge ratio is collected from an uniquely composed survey and somewhat complemented from the annual reports of firms that clearly discloses the notional amounts and principals, as the hedge ratio is defined as the derivative hedged part of the total exposure, following Guay and Kothari (2003) methodology for calculations. Furthermore, we acknowledge the difficulties in collecting accurate hedge ratio information from the survey and the annual report. The survey, as previously discussed, is divided into approximately hedge ratios and the feedback collected from the participating companies is that the total exposure is somewhat nominal, making it hard to provide perfect answers. Secondly, collecting hedge ratios from the annual reports has given relatively few data points, as most companies do not define or disclose the notional amounts or the total exposures in a consistent manner.

CEO Ownership:

From the behavioral theoretical perspective, the rise of management hedging activities can originate from personal preferences, overconfidence and risk aversion, learning to utilize company risk mitigation tools for self-serving incentives (Ogden, Jen and Connor, 2002). Following previous literature there is significant empirical evidence supporting that CEO preferences are impacting corporate risk management (see e.g. Adam and Fernando, 2006; Adam, Fernando and Golubeva, 2015; Croci, Del Giudice and Jankensgård 2017). Based on the theoretical approach of overconfidence and management entrenchment, combined with empirical evidence from Adam, Fernando and Golubeva (2015) we expect that CEO ownership should have a negative relationship with firm value as increased ownership leads to self-serving activities to protect the personal wealth. However, we also acknowledge the reasoning of a positive significant relationship between insider ownership and firm value. Evidence from Fok, Carroll, and Chiou (1997) suggests that managerial insider ownership enhances firm value as it reduces the agency cost of equity and thus suggests a positive relationship to firm value. Using the yearly CEO insider ownership, we develop a variable for testing the relationship of managerial insider ownership for hedging firms' effect on firm value.

BoD Ownership:

Previous literature in the topic has mainly focused on managerial insider ownership and preferences as the determinants for a firm's selections of hedging strategies (see e.g. Adam and Fernando, 2006; Adam, Fernando and Golubeva, 2015; Croci, Del Giudice and Jankensgård 2017). Development of the classically organized risk management has emerged towards the Enterprise Risk Management governance. This means that the ownership, policy setting and strategy formulation has shifted from management decisions towards board control (Jankensgård and Kapstad, 2021). Moreover, further acknowledgement is captured in the study's survey, where the results show that 97,3% of the responding companies have their BoD to formulate the hedging policies. Consequently, as the risk ownership shifts, the decision making and the incentives should be transferred as well, which is a somewhat new approach compared to previous empirical evidence and our own CEO variable discussion. However, introducing the BoD ownership variable we strive to capture the developments and shift in Swedish corporation's risk management. Also, based on the same argumentations as previously disclosed in the CEO variable section, we expected a similar ambiguous relationship. BoD ownership is measured yearly for each company and excluding CEO insider ownership, to capture the true effect from the BoD.

Foreign Ownership:

Furthermore, inspired by Oxelheim and Randøy (2003), empirical evidence suggests that foreign ownership has a significant positive effect on firm performance. In this paper, our intentions are to further develop the research by interacting the foreign ownership variable with hedging activities. Our initial expectation is that foreign ownership might serve as a proxy for a firm's corporate governance quality, which is somewhat concluded in Oxelheim and Randøy (2003). Moreover, following the empirical results from Allayannis, Lel and Miller (2012), firms with strong corporate governance have been awarded with hedging premiums comparable to weakly governed firms. Consequently, we expect the foreign ownership to be positively affecting hedging strategies and attach a hedging premium to companies with high ownership structure. Foreign ownership is measured as a ratio of foreign ownership divided by total ownership and collected yearly for each company.

5.4.3. Control Variables

Firm Size:

A commonly significant control variable affecting Tobin's Q is the size of the firm. Customarily used proxies are total assets or total sales (see e.g. Allayannis and Weston, 2001; Jankensgård, 2015). Previous literature identifies the rational foundation of the significant relationship to arise from higher profitability and likelihood of using derivatives as firm size increases. The prone relationship arises from high startup and fixed costs related to implementing a hedging program. Hence, increasing the likelihood for larger companies to engage in hedging activities compared to smaller companies (Allayannis and Weston, 2001). Consequently, we use the log of total assets in our model as the proxy for firm size.

Leverage:

Originated for Myers (1977) theoretical approach, the deadweight cost of having to reject potential profitable investments opportunities, due to being financially constrained is one negative professed determinant of firm value. However, the empirical evidence is ambiguous about if the relationship has a positive or negative impact. Smith and Stulz (1985) tax convex theory induces that leverage has a positive effect on firm value, as the increasing tax shield defers future tax liabilities, but on the other hand increases the likelihood of bankruptcy. To capture the effect of capital structure on firm value, we select the same ratio as e.g. Carter,

Rogers and Simkins (2006) and Jankensgård (2015) taking long term debt divided by total assets.

Availability to Financial Markets - Liquidity Measurement:

To capture the effect of a company's access to financial markets a commonly used proxy is dividends, consequently we introduce a dividend dummy equal to one if the company pays dividend in the current year and zero if not (see e.g. Allayannis and Weston, 2001; Jin and Jorion, 2006; Jankensgård, 2015). Theories suggest that firms not paying dividends have limited access to new capital consequently being constrained and therefore only takes on positive NPV projects (Allayannis and Weston, 2001). Accordingly, firms paying dividends should have a negative impact on Tobin´s Q. Nevertheless, dividend signaling is viewed as a positive signaling that commonly has a positive effect on firm value, suggesting the expected relationship to be somewhat ambiguous (Jin and Jorion, 2006).

Profitability

Firms with higher profitability are repeatedly rewarded with higher firm value. As a proxy we use return on assets (ROA) to control for this in the model. ROA is calculated as the net income divided by total assets (see e.g. Allayannis and Weston, 2001; Jin and Jorion, 2006; Jankensgård, 2015).

Investment- and Growth Opportunities

As previously mentioned above, empirical evidence suggests that a firm value is significantly dependent on profitable investment opportunities (Myers, 1977). Froot, Scharfstein and Stein (1993) argue theoretically that companies with large investment opportunities tend to hedge. Similar to e.g. Allayannis and Weston (2001) and Jin and Jorion (2006) we introduce a ratio of R&D to sales, as well as CAPEX to sales for capturing growth opportunities. Furthermore, we use the same treatment as suggested in Allayannis and Weston (2001), where we admit all missing values as zero. Since we investigate non-financial firms, there is a large variety in companies' investments. Consequently, including both CAPEX to sales and R&D to sales, our intention is to capture all investment opportunities across different industries.

Time and Industry Effects

As previously mentioned in the paper we introduce dummy variables for industrial and time effects for the purpose of capturing industrial and cyclical variations in our model (Wooldridge, 2016), inspired by the methodology of e.g. Allayannis and Weston (2001) and Jin and Jorion (2006).

Table 2: Variable Descriptions

Variables	Label	Definition	Source
Dependent			
Tobin's Q	Value creation	(Total book value of assets - total book value of equity + market value of equity) / Total book value of assets	Thomson Reuters
Control			
Total assets	Firm size	The natural logarithm of total book value of assets	Thomson Reuters
Debt to Assets	Leverage	The natural logarithm of long-term debt / total book value of assets	Thomson Reuters
Dividend	Liquidity	A dummy variable = 1 if the company pays dividend in the current year and 0 if not	Thomson Reuters
ROA	Profitability	Net income / Total book value of assets	Thomson Reuters
CAPEX to Sales	Investment opportunities	Total capital expenditures / Total sales	Thomson Reuters
R&D to Sales	Growth opportunities	Research and development spending / Total sales	Thomson Reuters
Explanatory variables			
Hedging	If a firm hedge	A dummy variable = 1 if the company is hedging and 0 if not	Annual reports
Currency Hedging	If a firm hedge its currency exposure	A dummy variable = 1 if the company is hedging its currency exposure and 0 if not	Annual reports
Interest Hedging	If a firm hedge its interest rate exposure	A dummy variable = 1 if the company is hedging its interest rate exposure and 0 if not	Annual reports
Commodity Hedging	If a firm hedge its commodity exposure	A dummy variable = 1 if the company is hedging its commodity exposure and 0 if not	Annual reports
CEO Ownership	Total CEO ownership	CEO Ownership as percentage of total share capital	Holdings Modular Finance
BoD Ownership	Total board ownership	Accumulated board member ownership as percentage of total share capital	Holdings Modular Finance
Foreign Ownership	Total foreign ownership	Accumulated foreign ownership as percentage of total share capital	Holdings Modular Finance
Hedge Ratio	Hedged exposure	Total hedged exposure / Total exposure	Survey / Annual reports

Note: The table presents an overview of variables used in this study. Firstly, the variable name is presented followed by how we label the purpose of it. Further the table presents how we define and calculate each individual variable followed by where and how it has been collected.

5.5. Statistical tests

5.5.1. Heteroskedasticity and Autocorrelation

To control for heteroskedasticity in our sample we will conduct a Whites test. For our coefficients to fulfill the regression criteria of being unbiased estimators, the assumption of homoscedasticity should hold. When heteroskedasticity is present the variance between the explanatory variables and the error term varies, causing the standard errors to be misrepresented (Wooldridge, 2016). If we detect presence of heteroskedasticity in our sample, we will follow Wooldridge (2016) recommendation and treat it by introducing clustered standard error to our model. Accordingly, clustering our models on a firm level will remove any firm effective correlations (Wooldridge, 2016). Additionally, by introducing clustered standard errors we mitigate the issues of autocorrelation in our fixed effects model. For the main random effect models, the time constant variables will automatically be omitted if there is no sample variation year on year, mitigating autocorrelation automatically (Wooldridge, 2016).

6. Empirical Results

The sixth chapter begins with descriptive statistics including summary statistics, mean difference tests and correlation analysis of the data. Further, the results of the regressions tests are given followed by testing of the study's hypotheses. Finally, robustness and delimitations of the paper are presented.

6.1. Univariate Analysis

6.1.1. Summary Statistics:

Table 3 presents the summary statistics for this study. For our accounting variables we have acknowledged the presence of extreme values that may interfere and misrepresent the sample in such a way that can affect the statistical efficiency of the paper's regression models. As a precautionary measure we have treated the accounting variables according to previous studies (see e.g. Jankensgård 2015) and winsorized at the 1st and 99th percentile to treat outliers. Moreover, we follow customary treatment effects and apply the natural logarithm of Tobin´s Q and our absolute value variable for total assets, in order to deal with the skewness and enhance normality (see. e.g. Allayannis and Weston, 2001; Jankensgård, 2015). Furthermore, from Table 3 we observe that 54% of our sample companies use financial instruments as risk mitigation tools for hedging exposures. In detail, 39,6% uses currency derivatives, 30,8% uses

interest rate derivatives and only 9% disclose that they use derivatives to hedge for commodity risk. Also, for our sample of collected hedge ratios we can see that on average the firms hedge 14,1% of their exposures. Our insider ownership data shows that CEO's on average hold 3% of the total capital in their employed companies. The median of 0,1% and maximum value of 69,9% indicates that there are some extreme values present, increasing the average size. Conclusively, the summary statistics suggest that the CEO holdings of their employed firms are quite low. For the BoD insider ownership, the average holding is substantially higher, amounting to around 20,01% of the total capital. The median of 16,4% suggests that the sample is quite normal distributed. However, the maximum value of 94,1% indicates that we might have some extreme values in the higher end, the explanation for these extreme values are evaluated and the reason is an ongoing process of delisting captured at the year-end collection. Lastly, foreign insider ownership calculates to an average of 29,1% of the total capital. Just as BoD ownership, the median is quite close to the average (25,2%) indicating somewhat normality distribution.

Furthermore, Table 3 demonstrates our accounting variables and a dummy variable capturing firms paying dividends. As previously mentioned we have treated all accounting variables for outliers by winzoring at the 1th and 99th percentile. Examining our firm value proxy, Tobin´s Q we can see that firms are on average valued 2,465 times their book value of assets. The Median of 1,605x indicates that we still have some extreme values present, which the maximum value of 13,026x somewhat confirms. For the rest of our accounting variables we can see in Table 3 that our average sample firm has 17406,999 million in book value of assets, spends about 45% of their sales on CAPEX and 12,9% on R&D expenses. Moreover, it holds on average 23,3% leverage, yields an annual ROA of 1% and 57,1% of our companies pay dividends. However, we acknowledge that even after treating our accounting variables, we still have a somewhat skewed sample distribution, which can be explained by the large variety of industries and different sized companies in different maturity stages.

Table 3: Summary Statistics

Variables	N	Mean	SD	Median	Min	Max
Explanatory variables						
Dividend	1403	0.571	0.495	1	0	1
Foreign Ownership	1403	0.291	0.204	0.252	0	0.987
BoD Ownership	1403	0.201	0.180	0.164	0	0.941
CEO Ownership	1403	0.030	0.084	0.001	0	0.699
Hedging	1403	0.540	0.499	1	0	1
Currency Hedging	1403	0.396	0.489	0	0	1
Interest Hedging	1403	0.308	0.462	0	0	1
Commodity Hedging	1403	0.090	0.286	0	0	1
Hedge Ratio	893	0.141	0.280	0	0	1
Winsorized accounting data						
Tobin's Q	1403	2.465	2.284	1.605	0.742	13.026
Total Assets	1403	17406.999	36678.310	2968.500	61.700	229900.000
CAPEX to Sales	1403	0.45	3.100	0.024	0	28.654
R&D to Sales	1403	0.129	0.675	0	0	5.462
Debt to Assets	1403	0.233	0.179	0.218	0	0.693
ROA	1403	0.010	0.178	0.052	-0.796	0.325

Note: The table displays summary statistics over the variables used in this study. The included variables in the table are presented and defined in Table 2 Variable descriptions. The accounting variables are all winsorized at the 1st and 99th percentile. Variables Dividend, Hedging, Currency Hedging, Interest Hedging and Commodity Hedging are all dummy variables.

6.1.2. Mean Difference Test

Table 7 presents a mean difference test of our sample firms categorized by hedging firms and non-hedging firms. From the summary statistics in Table 7, we can see that the typical accounting characteristics for or hedging companies are that they are larger, have a lower Tobin's Q ratio, are more leveraged, have higher profitability and pay more dividends than non-hedging firms. Moreover, all accounting variables are statistically significant at 1% level, different from the non-hedging firms. Interpreting the accounting variables impact, the results are somewhat expected and similar to typical characteristics of hedging firms (see e.g Myers 1977; Allayannis and Weston, 2001). However, what could be interpreted as somewhat contradictory to previous literature is the fact that CAPEX to Sales and R&D to Sales is significantly lower for hedging firms than non-hedgers. As previously presented, theoretically, firms with high growth and/or investment opportunities have greater incentives to hedge (see e.g Myers 1977; Allayannis and Weston, 2001). However, we expect our typical non-hedging firm from the sample to have characteristics of being a smaller opportunistic company,

spending a large portion of their revenue reinvesting it for expansion. For example, we can see that firms in the pharmaceutical industry on average have higher CAPEX and R&D expenses than revenue. Since the companies have low or even zero in sales, the CAPEX and R&D to Sales tends to be large, supporting the significant results that we can see in the mean difference test in Table 7. For our insider ownership variables, the results in Table 7 suggest that there is no statistically significant difference between hedgers and non-hedgers for CEO and BoD insider ownership. Nonetheless, we observe that foreign ownership is significantly larger for hedging firms than for non-hedging firms, suggesting that hedging firms might be more attractive for foreign investors. Accordingly, since hedging firms tend to have more foreign business, especially applicable for currency hedgers, than non-hedgers, rationale more international exposure should lead to higher visibility among foreign investors.

6.1.3. Pairwise Correlation Analysis

Presented in Table 8 is Pearson's Correlation Matrix introducing a pairwise correlation test for all variables used in the study. The correlation matrix indicates that almost all of the variables are moderately and strongly statistically significant with Tobin´s Q. The only exceptions are the subcategory hedging variable for currency and our instrumental variable measuring total board compensation. However, the economical indication of impact from the signs are somewhat in line with our expectations and previous literature, where larger companies being more financially constrained and paying dividends has a negative impact on Tobin´s Q. Furthermore, what initially can seem quite unrealistic is that profitability has a negative impact on Tobin´s Q. However, as previously mentioned, our sample consists of a variety of industries, where we can observe that the companies with the highest valuation (Tobin´s Q) usually fall into the category of more "opportunistic companies", meaning that they have no, or negative profitability and consequently, providing a logical explanation for the negative relations in our correlation matrix. Analyzing the relationship of ownership structure, the anticipated negative impact on CEO and BoD insider ownership on Tobin´s Q is confirmed, as well as the positive impact from foreign ownership. What is somewhat unexpected is the negative correlation of our hedging determinants, where currency hedging alone is not even significant with firm value. It can however be explained by Modigliani and Miller (1958) irrelevance theory, suggesting hedging to be non-value adding. Moreover, we find a significant correlation between our instrumental variable, board compensation and hedging companies, fulfilling the initial criteria of being irrelevant, but also the second one of being uncorrelated with our dependent variable Tobin´s Q. Conclusively, generally we find low and moderate significant

correlations between our explanatory variables limiting the possibility of multicollinearity in our sample.

6.2. The Effect of Hedging on Firm Value

As tabulated, Table 4 shows the regression models for testing Hypothesis 1, hedging activities' impact on firm value. The results from Model (2), using random effects, suggest that hedging has a significant positive effect on Tobin´s Q at the 1% level, as hedging firms are rewarded with a 15,3% hedging premium relative to non-hedgers. Hence, supporting previous empirical evidence in the literature that hedging is a value creating risk management tool (see e.g Allayannis and Weston 2001; Carter et al., 2006). The regression results from Model (4) using random effects, insinuate that foreign exchange risk is the only hedging activity that has a significant impact on firm value. Significant at 1%, using foreign exchange derivatives on average increases firm value (Tobin´s Q) with 14,6%. Furthermore, the results from Model (4) suggest that commodity and interest hedging have no significant effect on firm value. For commodity hedging we acknowledge the lack of sample firms as a disclaimer for interpreting the results carefully. Overall, only 27 of our 166 companies are committed to this type of derivative strategy. However, interpreting the results for currency hedging we find that our significant results align with previous research (see e.g Allayannis and Weston 2001; Allayannis, Lel and Miller, 2012), confirming the positive impact on firm value. Furthermore, as expected and aligning with the results from Allayannis, Lel and Miller (2012), the usage of interest rate derivatives has no significant impact on firm value. Actualizing the results and putting them into a more holistic perspective for our sample, we find the zero-interest climate, that has been present in Sweden since 2014, to be a possible explanation for the indifferent impact interest hedging has had on firm value in our sample.

For our ownership data, following Model (2) in Table 4, the results imply that there is a significant negative relationship between higher BoD insider ownership and firm value on the 5% level. This suggests that, for every 10% increase in BoD ownership, firm value decreases with 3,1%. In contrast, the results imply that foreign ownership is positively significant at the 5% level and has a positive impact on firm value of 2,98%, for every 10% increase in foreign ownership. Lastly, as expected and previously argued, the CEO insider ownership has no significant impact on firm value. Consequently, supporting our approach that a CEO´s ability to influence companies' strategies is stagnating and possibly not notable.

Moreover, the results suggest that firm size, leverage and dividends are all significant predictors at 1% in Model (2). For the economic impact of our control variables, we find that the negative effect of firm size is in line with previous studies on the topic (see e.g Allayannis and Weston 2001; Jankensgård, 2015). The ambiguous relationship of dividends, as previously discussed, justifies the positive impact accordingly supported by signaling theory of future profitability, combined with contradictory to the impact recorded by e.g Allayannis and Weston (2001) and Jin and Jorion (2006) who find a statistically significant negative effect. Moreover, the negative impact of leverage is expected and follows the findings of Myers (1977) regarding deadweight cost forcing companies to reject positive NPV projects, hence reducing the firm value due to financial constraints. Furthermore, we find profitability to be weakly significant with firm value and investment and/or growth opportunities to be non-significant in Model (2). The relationship of CAPEX to sales and R&D to sales being insignificant is in line with the finding of e.g Allayannis and Weston (2001) and Jankensgård (2015). However, the weakly significant relationship of profitability and firm value is somewhat unexpected, but not unique as we find it in previous studies as well (Jankensgård, 2015).

Observed in Table 9, running a White test for Model (1, 5, 8, 10, 12), the test result indicates that our sample experiences heteroskedasticity, as we have a Chi-square static in the range of 546,36 to 803,50 and a P-value of 0,000. Consequently, we have to reject the null hypothesis and acknowledge the presence of heteroskedasticity. Accordingly, following Wooldridge's (2016) suggestion and treating the models by introducing clustered standard errors for all our Models (1) to (14). Moreover, as previously discussed in section *5.3 Econometric Models*, the model selection of random effects is derived from the time constant explanatory variable. In contrast to pooled-OLS, random effects models account for serial correlation over time through the GLS. Following our model discussion in the methodology section, the random effects model is suggested to be more efficient than Pooled OLS and the model we focus on discussing.

6.2.1. Instrumental variable approach

To mitigate endogeneity concerns for our main explanatory variable, hedging, in the first hypothesis, we introduce several instrumental variables[1]. Presented in Table 4, Model (3b)

[1] The results from endogeneity tests including other instrumental variables are available from the authors upon request.

shows the regression results for our main instrumental variable BoD compensation. Model (3a) presents the first stage regression, indicating a strong positively significant relationship at the 1% level between BoD compensation and hedging, with a coefficient of 0,027. Furthermore, the joint hypothesis shown in Table 10, has an F-static of 1191, further supporting the strength of the results. Following Wooldridge (2016) indications, the F-static should be larger than 10, which 1191 considerably exceeds, implying that BoD compensation could be seen as a somewhat relevant and satisfying instrumental variable for hedging. Moreover, the results in Model (3b), the 2SLS model using random effects implies that hedging is statistically significant at 5% with a coefficient of 1,710, indicating that, ceteris paribus, a 10% increase in our instrumental variable hedging increases firm value by 17,1%. Hence, insinuating a positive premium for our hedging firms compared to non-hedgers and supporting our results from Model (2) and further enhancing hedging as being an exogenous variable explaining firm value.

Table 4: Regression Results for Model (1) to (4)

	Model (1) POLS	Model (2) Random effects	Model (3a) First-stage	Model (3b) 2SLS RE	Model 4 RE
Dependent variable	**Tobin's Q (log)**	**Tobin's Q (log)**	**Hedging**	**Tobin's Q (log)**	**Tobin's Q (log)**
Total Assets (log)	-0.089***	-0.141***	0.043***	-0.254***	-0.145***
	(0.022)	(0.024)	(0.013)	(0.059)	(0.027)
CAPEX to Sales	0.010	-0.001	-0.001**	0.001	-0.001
	(0.010)	(0.009)	(0.000)	(0.009)	(0.009)
Debt to Assets	-0.688***	-0.394***	0.027	-0.363**	-0.377***
	(0.191)	(0.122)	(0.065)	(0.151)	(0.123)
R&D to Sales	0.063	0.011	0.007	-0.006	0.011
	(0.044)	(0.042)	(0.008)	(0.048)	(0.043)
ROA	0.602**	0.272*	0.020	0.261	0.286*
	(0.238)	(0.163)	(0.077)	(0.169)	(0.163)
Dividend	0.185***	0.103***	-0.002	0.094***	0.104***
	(0.047)	(0.023)	(0.013)	(0.030)	(0.023)
Hedging	0.041	0.153***			
	(0.066)	(0.054)			
$\widehat{\text{Hedging}}$				1.710**	
				(0.720)	
Currency Hedge					0.146***
					(0.056)
Interest Hedge					0.066
					(0.055)
Commodity Hedge					0.024
					(0.073)
BoD Ownership	-0.412***	-0.310**	-0.086	-0.156	-0.316**
	(0.154)	(0.132)	(0.072)	(0.181)	(0.132)
CEO Ownership	0.101	-0.076	-0.107	0.077	-0.060
	(0.289)	(0.304)	(0.742)	(0.343)	(0.303)
Foreign Ownership	0.385**	0.298**	-0.008	0.255	0.302**
	(0.159)	(0.138)	(0.088)	(0.192)	(0.138)
Board Compensation			0.027***		
			(0.008)		
Constant	1.414***	1.370***	0.610***	0.671*	1.317***
	(0.198)	(0.176)	(0.093)	(0.399)	(0.165)
Observations	1403	1403	1403	1403	1403
R-squared	0.423				
Industry effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Number of firms	297	297	297	297	297

Note: The table presents the regression results for Models (1) - (4) with pooled-OLS, Random Effects, First-stage least square and Two-stage least square (Random Effect) with the purpose of examining hedging's impact on firm value, captured by Tobin's Q. The dependent variable is Tobin's Q for Model (1), (2), (3b) and (4), whereas the dependent variable for Model (3a) is Hedging tested against the explanatory variables as well as the instrumental variable Board Compensation. In Table 10, we present the results from a F-test for our instrumental variable and validate its strength. Model (1) displays the results for a normal pooled-OLS regression, and Model (2) uses Random Effects on the same base model. Model (3a) presents a First-stage least square at the same time where Model (3b) displays the Two-stage least square with Random Effects. Model (4) tests the impacts separated hedging derivatives have on firm value, based on the same model with Random Effects used in Model (1) and (2).

Clustered robust standard errors in parentheses
****p <0.01, **p <0.05, *p <0.10*

6.2.2. Hedging as a Continuous Variable

In Table 5, Models (5) to (7) introduce hedging as a continuous variable, hedge ratio, complementing our binary hedging models seen in Table 4. For model selection we tabulate the Hausman test. As specified in Table 11, the results indicate that we reject the null hypothesis, consequently selecting the fixed effect model. Shown in Table 5 and Model (7), using the fixed effects model we find that hedging is significant at 10% and has a positive impact on firm value with a slope of 0,046. The results imply that there is a weakly significant hedging premium that increases as firms increase their hedging positions, which strengthen the results displayed in Model (2) from Table 4.

Table 5: Regression Results for Model (5) to (7)

	Model (5) **POLS**	**Model (6)** **RE**	**Model (7)** **FE**
Dependent variable	**Tobin's Q (log)**	**Tobin's Q (log)**	**Tobin's Q (log)**
Total Assets (log)	-0.089***	-0.171***	-0.299***
	(0.030)	(0.032)	(0.057)
Capex to Sales	0.007	-0.001	-0.001
	(0.010)	(0.009)	(0.009)
Debt to Assets	-1.060***	-0.538***	-0.289*
	(0.218)	(0.147)	(0.169)
R&D to Sales	0.063	0.013	-0.005
	(0.045)	(0.046)	(0.051)
ROA	0.424	0.309*	0.329*
	(0.283)	(0.186)	(0.191)
Dividend	0.187***	0.090***	0.069**
	(0.065)	(0.031)	(0.033)
Hedge Ratio	0.021*	0.043***	0.046*
	(0.013)	(0.012)	(0.027)
BoD Ownership	-0.566***	-0.434**	-0.339
	(0.213)	(0.187)	(0.215)
CEO Ownership	0.797	0.157	-0.148
	(0.760)	(0.493)	(0.410)
Foreign Ownership	0.285	0.207	-0.012
	(0.213)	(0.191)	(0.250)
Constant	1.924***	1.618***	3.237***
	(0.318)	(0.217)	(0.473)
Observations	893	893	893
R-squared	0.405		0.203
Industry effects	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Number of firms	199	199	199

Note: The table presents the regression results for Models (5) - (7) using pooled-OLS, Random Effects and Fixed Effects with the purpose of examining hedging's impact on firm value, captured by Tobin's Q. All models are based on the same regression. The models in presented differentiate themselves from the models in Table 4, by testing the hedging premium with a continuous variable, Hedge Ratio. Moreover, the firm-year observations in Models (5) - (7) are lower (893) compared to the models presented in Table 4 (1403) due to less available information for the continuous variable for hedging.

Clustered robust standard errors in parentheses
****p <0.01, **p <0.05, *p <0.10*

6.2.3. Hypothesis Testing 1

As previously discussed in section *5.3 Econometric Models*, our main model selection for testing the study's first hypothesis is by using a random effect model and enhancing the robustness by introducing a sample applicable for using a fixed effects model. To strengthen our results and address endogeneity we introduce both an instrumental variable and a second regression model capturing hedging as a continuous variable. As aforementioned, the first hypothesis is formulated as follows:

Hypothesis 1: *Hedging has a positive relationship on firm value (Tobin´s Q).*

Our results from Models (2), (3b) and (7) suggest that hedging has a significant effect on Tobin's Q. Interpreting the models we find that the economic impact of hedging on firm value is somewhat ambiguous, however we can confirm a significant positive relationship. Therefore, we successfully reject the null hypothesis that hedging has no significant effect on firm value and confirm our initial assumption that hedging increases firm value.

6.3. The Effect of Hedging with Insider Ownership

Presented in Table 6, Model (8) to (14) introduces our hedging interacted models. The regression results from Model (8) to (11), where hedging is interacted with CEO ownership and BoD ownership are both statistically insignificant for explaining firm value. As expected, and contrary to previous studies, (see e.g Tufano, 1996; Kumar and Rabinovitch, 2013) our results suggest that CEO insider ownership has no significant effect on the firm value when interacted with hedging. From Table 4, the initial results from regression model (2) suggest that CEO insider ownership has no effect on firm value. Hence, supporting our initial argumentation of the new trend of centralized risk management philosophy transferring CEO influences away from risk management strategies. However, more surprisingly we also find insignificant results for BoD insider ownership for hedging strategies. Moreover, the data collection from our survey indicates that 97,1% of our respondent firms disclose that their risk management strategies and policies are formulated by the BoD´s. Furthermore, we can see indication in our regression model (2), in Table 4, that BoD insider ownership has a negative impact on Tobin´s Q, giving us some kind of indication that there is an interesting relationship to be investigated.

6.3.1. Hypothesis Testing 2

In line with the above discussion in section *5.3. Econometric Models*, clustered random-effect models are to be preferred when testing the hypotheses 2.1 and 2.2. Moreover, by combining random-effect models with interaction terms consisting of the desired attributes we want to examine the partial effect of insider ownership and our main explanatory variable hedging, we assume to capture the possible impact. Consequently, Models (9) and (11) were chosen to test the hypotheses with the purpose to investigate the possible value impact that various insider ownership structures have on firm value (Tobin's Q). The hypotheses are formulated as follows:

Hypothesis 2.1: *The relationship between hedging and firm value (Tobin's Q) is negatively affected by higher CEO insider ownership*

Hypothesis 2.2: *The relationship between hedging and firm value (Tobin's Q) is negatively affected by higher BoD insider ownership*

As the results in Table 6 indicate, for our hypotheses 2.1. and 2.2., we fail to reject the null hypothesis and conclude that there is no significant relationship between hedging interaction with CEO and BoD insider ownership, on firm value (Tobin's Q).

6.4. The Effect of Hedging with Foreign Ownership

The regression Models (13) to (14) presented in Table 6 suggests that there is an evidential positive significance on firm value, when interacting hedging with foreign ownership. Interpreting Model (13) using random effects and the hedging dummy, we find a significant relationship at the 1% level, where a 10% increase in foreign ownership, for a firm participating in hedging activities, increases the firm value by 5,44% (0,0021 + 0,0523). The results are somewhat in line with our expectations and previous literature finding where foreign influence on ownership structure and board members enhances the governance, and further operations, in a value creating interest of all shareholders (Oxelheim and Randøy, 2003). Also, the results could be applicable for explaining the selection of risk management strategies. Moreover, breaking down hedging, the results in model (14) suggest that there is an even larger positive impact on firm value when currency hedging and foreign ownership is interacted. The results

imply a significance at 1%, where a 10 % increase in foreign ownership for hedging firms, increases firm value by 6,82% (0,0092+0,0590). The large economic impact supports the evidence of foreign ownership's effect on value creating risk management strategies.

6.4.1. Hypothesis testing 3

As previously mentioned, the random effect models are argued to be the most suitable approach and least biased models for the testing of the hypotheses throughout the whole study. Therefore, the third and last hypothesis is tested and evaluated on the results in Model (13). The hypothesis is stated as follows:

Hypothesis 3: *The relationship between hedging and firm value (Tobin's Q) is positively affected by higher foreign ownership*

As the results displayed in Table 6 and Model (13), we reject the null hypothesis and conclude that hedging interacted with foreign insider ownership has a positive significant effect on firm value, successfully accepting our initial Hypothesis 3.

Table 6: Regression Results for Model (8) to (14)

	Model (8) POLS	Model (9) RE	Model (10) POLS	Model (11) RE	Model (12) POLS	Model (13) RE	Model (14) RE
Dependent variable	**Tobin's Q (log)**	**Tobin's Q (log)**	**Tobin's Q (log)**	**Tobin's Q (log)**	**Tobin's Q (log)**	**Tobin's Q (log)**	**Tobin's Q (log)**
Total Assets (log)	-0.088***	-0.141***	-0.088***	-0.140***	-0.089***	-0.141***	-0.146***
	(0.022)	(0.024)	(0.022)	(0.025)	(0.022)	(0.024)	(0.027)
Capex to Sales	0.010	-0.001	0.010	-0.001	0.010	-0.000	-0.000
	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)	(0.009)	(0.009)
Total Debt to Total Assets	-0.684***	-0.394***	-0.699***	-0.400***	-0.689***	-0.400***	-0.377***
	(0.192)	(0.122)	(0.191)	(0.123)	(0.190)	(0.120)	(0.123)
R&D to Sales	0.064	0.011	0.062	0.011	0.063	0.010	0.009
	(0.044)	(0.042)	(0.043)	(0.043)	(0.044)	(0.043)	(0.043)
ROA	0.595**	0.271*	0.610**	0.272*	0.602**	0.253	0.278*
	(0.238)	(0.163)	(0.244)	(0.163)	(0.238)	(0.162)	(0.164)
Dividend	0.187***	0.103***	0.187***	0.103***	0.185***	0.105***	0.102***
	(0.047)	(0.023)	(0.047)	(0.023)	(0.047)	(0.022)	(0.022)
Hedging	0.052	0.154***	-0.027	0.135*	0.039	-0.023	
	(0.069)	(0.056)	(0.090)	(0.077)	(0.097)	(0.080)	
BoD Ownership	-0.408***	-0.311**	-0.579***	-0.345*	-0.412***	-0.317**	-0.314**
	(0.154)	(0.131)	(0.222)	(0.181)	(0.154)	(0.130)	(0.130)
CEO Ownership	0.409	-0.036	0.111	-0.065	0.101	-0.062	-0.080
	(0.722)	(0.569)	(0.290)	(0.303)	(0.290)	(0.298)	(0.298)
Foreign Ownership	0.382**	0.298**	0.383**	0.298**	0.382*	0.021	0.092
	(0.159)	(0.138)	(0.159)	(0.139)	(0.229)	(0.186)	(0.159)
Hedging x CEO Ownership	-0.421	-0.064					
	(0.773)	(0.656)					
Hedging x BoD Ownership			0.321	0.073			
			(0.249)	(0.177)			
Hedging x Foreign Ownership					0.005	0.523***	
					(0.266)	(0.183)	
Currency Hedge							-0.041
							(0.082)
Interest Hedge							0.062
							(0.056)
Commodity Hedge							-0.002
							(0.074)
Currency Hedging x Foreign Ownership							0.590***
							(0.208)
Constant	1.394***	1.369***	1.452***	1.382***	1.414***	1.527***	1.502***
	(0.202)	(0.173)	(0.200)	(0.181)	(0.201)	(0.191)	(0.182)
Observations	1403	1403	1403	1403	1403	1403	1403
R-squared	0.424		0.425		0.423		
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of firms	297	297	297	297	297	297	297

Note: The table presents the regression results for Models (8) - (14) using pooled-OLS and Random Effects with the purpose of investigating how various ownership structures interacted with hedging affect firm value, captured by Tobin's Q. The dependent variable is Tobin's Q for all models in the table. Model (8) and (9) tests CEO Ownership's impact, Model (10) and (11) tests BoD Ownership's impact and Model (12) and (13) tests the effect based on Foreign Ownership. Model (14) presents a regression using Random Effects where the Foreign Ownership is interacted with Currency Hedging, based on the findings in Model (4) in Table 4.

Clustered robust standard errors in parentheses
****p<0.01, **p<0.05, *p<0.01*

6.5. Robustness Tests

The robustness precautions methods and regression validation has already been thoroughly discussed throughout the paper, however emphasizing the importance of robustness validation of our results, we present a summarized section of treatments. As previously discussed in section *5.4 Variables Description* our control and accounting variables are carefully evaluated and selected based on previous studies, for the purpose of mitigating omitted variable biases and enhance the robustness of our main explanatory variables (see e.g. Allayannis and Weston, 2001; Carter, Rogers and Simkins, 2006; Bartram, Brown and Conrad, 2011). Furthermore, our introduction of dummy variables for capturing yearly and industrial effects, enhances the robustness by capturing any macroeconomic or industrial trends that might affect the results of our variables. (see e.g Allayannis and Weston, 2001). As previously mentioned we introduce several regression models for enhancing the robustness of hedging activities relationship on firm value. The instrumental approach in Model (3b), Table 4 mitigates the endogeneity concerns and the results imply an exogenous relationship between hedging and firm value. Consequently, introducing hedging as a continuous variable supports our initial results and implies that there is a robust relationship between hedging and firm value. To deal with the possibility of serial correlation in the error term we consequently rely on the random effects model, as previously discussed in section *5.3 Econometric Models*, to deal with heterogeneity issues that are found in whites test in Table 9 we introduce clustered standard errors. For the potential issues of multicollinearity in our regression models, STATA automatically drops omitted variables. Furthermore, as previously discussed in section *6.1.3 Pairwise Correlation Analysis,* the correlation Table 8 suggests that there is low risk for multicollinearity presence in our sample.

Following Woolridge suggested robustness enhancement, we cluster some of models on different levels to increase the validity of the results. Following Table 12 we can see the Models (2), (3), (4), (7) and (13) clustered on industry level. The results after clustering on industry level yields somewhat the same results. Noticeable is a slight significant reduction in Model (2) of foreign ownership and Model (4) for currency hedging. Although, the overall results from changing the level of clustering support the initial results and consequently enhances the validity and robustness.

Furthermore, in order to validate our regression results for Hypothesis 3, we introduce a categorization in the sample selection based on the median foreign holding of 29,1%, creating a dummy variable for companies with high respectively low foreign ownership. In Table 13, Model (15) and (16) reports the results for the dummy approach of foreign ownership interacted with hedging. Interpreting the regression models, we can see that the empirical results support our argumentation of larger foreign ownership affecting hedging strategies and, ultimately, the firm value. As Model (16) shows no significant result for low foreign ownership interacted for hedging, whereas Model (15) displays a positive significant relationship. Consequently, we enhance the robustness of the results from the original Model (13), where foreign ownership interacted with hedging as a positive impact on firm value.

6.6. Limitations

For our first hypothesis, when evaluating the relationship between hedging and firm value, we found some implication in the collection of hedge ratios. As previously mentioned in section *5.4.1 Sample selection and data collection*, we used a survey and manually collected hedge ratios. To ensure validity in our data, we took a restrictive approach for collecting the manual collection of hedge ratios, meaning that we only collected hedge ratios that were consistently presented (see Appendix B for examples). However, the lack of data for our hedging firms, due to restrictive responses and inconsistency in the annual reports, can be seen as somewhat troublesome when interpreting the results, therefore we take a cautious approach for making any conclusion. Nonetheless, the tabulated results for hedge ratios should be seen as a robust enhancer to our results and not as a stand-alone model for accepting our first hypothesis. We also acknowledge that there could be some errors recorded in the manual collection of hedging companies. Meticulous systematic classification of hedging has been conducted based on information from annual reports for our sample companies. Nonetheless, when data is manually collected we have to acknowledge the possibility of human errors.

7. Analysis

The purpose of this chapter is to analyze the empirical results in relation to aforementioned theories and empirical papers within this study's field of research. More specifically, the value impact from hedging activities is investigated, followed by an analysis of the influence that various ownership structures could have.

7.1. Hedging's Effect on Firm Value

Confirmed by our initial regression results, we find that hedging has a significant positive effect on firm value. For validation and to deal with endogeneity issues in our results we introduced an instrumental variable approach. Initially we tested several instrumental variables, inspired by i.e. Bartram, Brown and Conrad (2011), we created an instrumental variable that originates from the average frequency of firms heading in an industry and in industries on a yearly basis. However, due to the variable qualifying as rather weak, we rejected it and therefore it is not disclosed in the paper. Furthermore, inspired by Croci, Del Giudice and Jankensgård (2017) study, we introduced BoD compensation as our instrumental variable and found it to be both relevant and significant in Model (3a) and (3b). Accordingly validating our regression models to capture the exogenous effect of our main explanatory variable, hedging.

To complement the study even further, we introduced a survey that captures the hedging activities as a continuous variable, hedge ratio. As the results display, the significance in Model (7) gets a somewhat weaker significance, which might be due to the small sample size of hedging companies that are included in the study. Nevertheless, the results imply that hedging has a positively significant effect on firm value aligning with previous literature in the topic (see e.g. Allayannis and Weston 2001; Allayannis, Lel and Miller, 2012). Following the theoretical approaches, the results contradict the irrelevance theory from Modigliani and Millers (1958). However, easing on the perfect capital market assumptions, it is reasonable to expect the theory not to hold. Possible explanations for the value creating activity can mainly be found in the currency hedging, emphasizing the mitigation of cash flow variability and in the extension internal financing for profitable projects (see e.g. Froot, Scharfstein and Stein, 1993; Bessembinder, 1991; Carter, Rogers and Simkins; 2006; Aretz and Bartram, 2010). However, comparing the impact from using foreign currency derivatives our premium, using the random effects model, is quite higher suggesting 14,6%, compared to Allayannis and Weston (2001) 4,9% for US firms and Allayannis, Lel and Miller (2012) 10,7% using a more

global and international sample. Following Allayannis, Lel and Miller (2012) argumentation, one possible explanation for the excessive premium in our sample compared to previous studies, is that Swedish firms have higher currency exposure than the US-firms and additionally the volatility of the currencies outside the US, tend to be higher, somewhat justifying a higher premium for companies using currency hedging.

7.2. Corporate Ownership Structure

Investigating the motives and rationales behind risk mitigating activities that companies implement, we originally argued for CEO insider ownership to be an indifferent variable to hedging strategies, contrary to previous research from e.g Tufano (1996) or Kumar and Rabinovitch (2013), as well as the theoretical framework of management entrenchment covered in Ogden, Jen. and Connor (2002). Accordingly, supported by somewhat of an ownership transfer towards the BoD being the new risk management policy setters (Jankensgård and Kapstad, 2021). Additionally, supported by our survey results, concluding that 97,1% of our hedging companies have their strategies formulated and owned by the BoD. The empowerment transfer introduces for the delicate question if BoD follows the empirical evidence of CEO entrenchment and interacts in self-serving activities for personal profit maximization. However, insightfully we also acknowledge the potential of corporate rubber-stamping relationships whereas the BoDs might just act as risk owners formally and the true strategies are created on an operational level. Nonetheless, initially we record an effect of BoD inside ownership to be statistically negatively significant on firm value in Model (2). Thus, the results somewhat support our initial idea of BoD entrenchment and opening for the possibility of a power transfer that is comparable to the empirical evidence of CEO self-serving activities, destroying firm value. However, introducing an interaction term between BoD insider ownership and hedging, the partial effect on firm value is found to be insignificant, as seen in Model (11), which fails to support our initial hypothesis. The results could however be interpreted as a well-integrated Enterprise Risk Management system are present, declining any risk mitigating activities that are non-value creating due to strong implemented governance systems (Jankensgård and Kapstad, 2021).

Moreover, following Oxelheim and Randøy (2003) conclusion that foreign owners require an increased corporate governance structure to properly mitigate non-domestic investment, could be the explanation for the superior market values that hedging companies with high foreign

insider ownership are rewarded with. Intertwining the possible interpretation of our results from CEO and BoD ownership with foreign ownership, we find a somewhat interesting common explanatory determinant in corporate governance. Analyzing Allayannis, Lel and Miller (2012) empirical results, their concluding findings is that strong corporate governance mitigates any managerial speculation and attempts of committing to self-serving activities. This suggests that foreign ownership, in our results, could potentially be seen as somewhat of a proxy of governance quality. The results can be somewhat explained by classical mitigation theories of reducing agency costs and management entrenchment (Ogden, Jen. and Connor, 2002), as one of the basic conditions for foreign investors to invest abroad is derived from the opportunity to monitor and collect reliable information (Oxelheim and Randøy, 2003). Implementing a strong governance structure is suggested to mitigate the possibility of self-serving activities and speculative hedging activities for the inside owners, while having a large foreign insider ownership indirectly signals a quality stamp in enhanced governance systems and consequently postulates value creating hedging strategies. This reasoning aligns with Allayannis, Lel and Miller (2012) empirical evidence indicates a significant hedging premium for firms with a high governance score, relative to non-hedgers. Moreover, their results indicate no hedging premium for firms having weak corporate governance systems. Consequently, introducing an interesting relationship between foreign ownership and governance quality, that has a significant effect on hedging strategies and the determination if value is created through it.

8. Conclusion

Previous literature has extensively investigated hedging's role and impact on firm value, empirically contributing with ambiguous results. This study has investigated the relationship between hedging and firm value, as well as introducing an ownership perspective to investigate the internal forces and effects on firm value. Using a sample of 297 Swedish non-financial firms publicly traded on the main market, during the present period of 2017-2021, complemented by exclusive hand-collected hedging variables combined in a new unique perspective, we shed actualized light on this well-examined field of study. Also, by using clustered random effect model, fixed effect model and an instrumental variable approach, we address any endogeneity concerns for our main explanatory variable hedging. The results from our regression models are unanimous, implying that hedging is in fact a positive significant determinant of firm value. Our findings show that firms that decide to use financial derivatives for hedging, have an average valuation premium of 15,3% compared to non-hedging firms.

The results align with previous research in the topic by i.e Allayannis and Weston (2001) and Carter, Rogers and Simkins (2006) and reinforce the voices for the ones arguing for the valid consistent existence of a hedging premium.

For the investigation of insider ownership structure, our results imply that CEO and BoD ownership, interacted with hedging, has no significant partial effect on firm value. Hence, contradicting the theoretical approach of management entrenchment and managerial hedging determinants from previous studies (see e.g Tufano, 1996; Adam et al., 2015. However, supported by the empirical results from Allayannis, Lel and Miller (2012), one possible explanation for the results could be strong governance mechanisms and monitoring, which agrees with classic theories of mitigating management entrenchment and self-serving activities (Ogden, Jen. and Connor, 2002). Conclusively, these results suggest that the effect of transferring towards Enterprise Risk Management might enhance the corporate governance structure and play a central role in determining hedging strategies that successfully creates value. Thus, proceeding with a delicate question of the governance attributes that formulates a value creating risk management strategy and mitigates any insider owners from participating in self-serving activities, leaving an academic gap for future research to investigate the determining attributes even further. Moreover, this study contributes with unique evidence of foreign ownership's effect on hedging premium, whereas the partial effect of the interaction has a strong significant positive effect on firm value. The empirical results suggest that the partial effect of a 10% increase in foreign ownership increases firm value of 5,44% on average. The large economic impact and strong significance implies that foreign ownership contributes to value creating hedging strategies. Interpreting the explanation of why the premium emerges, there is evidence proposing foreign ownership to be somewhat a proxy for the quality of corporate governance (Oxelheim and Randøy, 2003). Suggested by our results, one can embrace the thesis that foreign ownership, in contrast to managerial inside ownership, increases firm value and enhances the corporate governance structures, which could be interpreted as positive signaling to investors. The increased foreign ownership suggests to work as a mechanism for ensuring quality enhancement and rejecting the possibility of any individuals to entrench self-serving hedging activities, in line with Allayannis, Lel and Miller (2012). Finally, to the best of our knowledge, these findings are exclusive within the research topic of hedging premium, and enriches the understanding of which corporate ownership structures that conceivably increases firm value. Hence, it enhances the rationales for investigating the relationship within this empirical field even further.

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Tables

Table 7: Mean Differences

	Hedging firms				Non-hedging firms					
	N	**Mean**	**Median**	**SD**	**N**	**Mean**	**Median**	**SD**	**Mean difference**	**T**
Tobin's Q	755	2.099	1.443	1.902	648	2.892	1.889	2.598	0.792	6.579***
Total Assets	755	29850.021	8506.000	46265.394	648	2909.342	912.582	5431.564	-26940.68	-14.735***
CAPEX to Sales	755	0.057	0.025	0.134	648	0.907	0.023	4.518	0.850	1.172***
R&D to Sales	755	0.033	0.000	0.264	648	0.240	0.000	0.940	0.206	5.791***
Debt to Assets	755	0.276	0.259	0.171	648	0.182	0.140	0.175	-0.0933	-10.095***
ROA	755	0.055	0.061	0.107	648	-0.042	0.033	0.223	-0.0973	-10.626***
Board Ownership	755	0.203	0.169	0.178	648	0.198	0.149	0.182	-0.004	-0.445
CEO Ownership	755	0.032	0.001	0.097	648	0.028	0.003	0.065	-0.003	-0.817
Foreign Ownership	755	0.318	0.290	0.208	648	0.259	0.217	0.193	-0.0583	-5.403***
Dividends	755	0.697	1.000	0.460	648	0.424	0.000	0.495	-0.272	-10.676***

Note: The table presents a test for differences in mean between hedging and non-hedging firms. Moreover, the table displays the number of firms included in each sub group, the mean, median, standard deviation, mean difference and the T-statistics of the differences. The split between our sample firms is based on our variable Hedging, whereas a 1 indicates if a firm hedge and 0 if it does not hedge.

****p <0.01, **p <0.05, *p <0.01*

Table 8: Pearson's Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Tobin's Q (log)	1.000														
(2) Total Assets (log)	-0.325***	1.000													
(3) Debt to Assets	-0.415***	0.445***	1.000												
(4) CAPEX to Sales	0.119***	-0.163***	-0.126***	1.000											
(5) R&D to Sales	0.200***	-0.207***	-0.187***	0.098***	1.000										
(6) ROA	-0.119***	0.379***	0.209***	-0.254***	-0.370***	1.000									
(7) Dividend	-0.068**	0.413***	0.174***	-0.151***	-0.200***	0.450***	1.000								
(8) Foreign Ownership	0.058**	0.334***	0.017	-0.045*	-0.047*	0.131***	0.084***	1.000							
(9) BoD Ownership	-0.186***	-0.001	0.108***	-0.058**	-0.106***	0.095***	0.009	-0.209***	1.000						
(10) CEO Ownership	-0.067**	0.037	0.139***	-0.023	-0.042	0.074***	0.000	-0.181***	-0.141***	1.000					
(11) Currency Hedge	-0.020	0.330***	-0.048*	-0.104***	-0.103***	0.181***	0.159***	0.170***	0.000	-0.127***	1.000				
(12) Interest Hedge	-0.311***	0.629***	0.424***	-0.086***	-0.121***	0.181***	0.285***	0.154***	-0.008	0.060**	0.250***	1.000			
(13) Commodity Hedge	-0.124***	0.303***	0.003	-0.034	-0.056**	0.073***	0.116***	0.167***	-0.052*	-0.048*	0.251***	0.266***	1.000		
(14) Hedging	-0.204***	0.544***	0.263***	-0.137***	-0.153***	0.273***	0.271***	0.141***	0.012	0.028	0.747***	0.616***	0.290***	1.000	
(15) Board Comp.	-0.025	0.672***	0.051*	-0.081***	-0.067**	0.125***	0.251***	0.390***	-0.098***	-0.184***	0.393***	0.366***	0.340***	0.348***	1.000

Note: The table presents a Pearson's Correlation Matrix for the variables Tobin's Q (log), Total Assets (log), Debt to Assets, CAPEX to Sales, R&D to Sales, ROA, Dividend, Foreign Ownership, Board Ownership, CEO Ownership, Currency Hedge, Interest Hedge, Commodity Hedge, Hedging and Board Compensation.

****p <0.01, **p <0.05, *p <0.01*

Table 9: Heteroskedasticity Test

Heteroskedasticity test					
Test: White test	**H_0**	**Test Statistic**	**P-value**	**Decision**	**Heteroskedasticity**
Stata Test (Chi-Squared) - Model 1	Homoskedasticity	769.51	0.0000	Reject	Yes
Stata Test (Chi-Squared) - Model 5	Homoskedasticity	545.36	0.0000	Reject	Yes
Stata Test (Chi-Squared) - Model 8	Homoskedasticity	803.50	0.0000	Reject	Yes
Stata Test (Chi-Squared) - Model 10	Homoskedasticity	799.57	0.0000	Reject	Yes
Stata Test (Chi-Squared) - Model 12	Homoskedasticity	801.28	0.0000	Reject	Yes

Table 10: F-test for Instrumental Variable

Test for instrumental variable	**H_0**	**Test Statistic**	**Prob. > F**	**Decision**	**Weak Instrument?**
F-test					
Model 3a	Weak instrument	1191.00	0.0000	Reject	No

Table 11: Hausman Test

Hausman test	**H_0**	**Test Statistic**	**Prob. > F**	**Decision**	**Selected model**
Hausman Chi-square test					
Model 6-7	Random effects is the appropriate model	50.42	0.0000	Reject	Fixed effects

Table 12: Robustness Test for Model (2), (3), (4), (7) and (13)

	Model (2) RE	Model (3a) First-stage	Model (3b) 2SLS	Model (4) RE	Model (7) FE	Model (13) RE
Dependent variable	**Tobin's Q (log)**	**Hedging**	**Tobin's Q (log)**	**Tobin's Q (log)**	**Tobin's Q (log)**	**Tobin's Q (log)**
Total Assets (log)	-0.141***	0.043**	-0.254***	-0.145***	-0.299***	-0.141***
	(0.038)	(0.017)	(0.070)	(0.041)	(0.057)	(0.024)
CAPEX to Sales	-0.001	-0.001***	0.001	-0.001	-0.001	-0.000
	(0.001)	(0.000)	(0.002)	(0.001)	(0.009)	(0.009)
Debt to Assets	-0.394***	0.026	-0.363***	-0.377***	-0.289*	-0.400***
	(0.132)	(0.063)	(0.119)	(0.130)	(0.169)	(0.120)
R&D to Sales	0.011	0.007***	-0.006	0.011	-0.005	0.010
	(0.021)	(0.002)	(0.028)	(0.021)	(0.051)	(0.043)
ROA	0.272	0.020	0.261	0.286	0.329*	0.253
	(0.295)	(0.043)	(0.235)	(0.292)	(0.191)	(0.162)
Dividend	0.103***	-0.002	0.094***	0.104***	0.069**	0.105***
	(0.025)	(0.013)	(0.033)	(0.026)	(0.033)	(0.022)
Hedging	0.153**		1.710**			-0.023
	(0.070)		(0.779)			(0.080)
Hedge Ratio					0.046*	
					(0.027)	
Currency Hedge				0.146**		
				(0.069)		
Interest Hedge				0.066		
				(0.064)		
Commodity Hedge				0.024		
				(0.079)		
BOD Ownership	-0.310***	-0.086	-0.156	-0.316***	-0.339	-0.317**
	(0.076)	(0.074)	(0.099)	(0.076)	(0.215)	(0.130)
CEO Ownership	-0.076	-0.107	0.077	-0.060	-0.148	-0.062
	(0.247)	(0.080)	(0.198)	(0.244)	(0.410)	(0.298)
Foreign Ownership	0.298*	-0.008	0.256	0.302*	-0.012	0.021
	(0.172)	(0.083)	(0.299)	(0.167)	(0.250)	(0.186)
Hedging x Foreign Ownership						0.523***
						(0.183)
Board Compensation		0.027***				
		(0.007)				
Constant	1.370***	0.609***	0.671**	1.317***	3.237***	1.527***
	(0.283)	(0.121)	(0.295)	(0.238)	(0.473)	(0.191)
Observations	1403	1403	1403	1403	893	1403
R-squared					0.203	
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Number of firms	297	297	297	297	199	297

Note: The table shows regression models with the purpose to robust check Model (2), (3), (4), (7) and (13), by clustering robust standard errors on economic industry. For model specifications, see original regression tables and Appendix A.

Cluster-robust standard errors on industry in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Table 13: Robustness Test for Hypothesis 3

	Model (15) RE	Model (16) RE
Dependent variable	**Tobin's Q (log)**	**Tobin's Q (log)**
Total Assets (log)	-0.133***	-0.136***
	(0.024)	(0.024)
CAPEX to Sales	-0.000	-0.000
	(0.009)	(0.009)
R&D to Sales	0.011	0.010
	(0.043)	(0.043)
Total Debt to Total Assets	-0.410***	-0.408***
	(0.122)	(0.121)
ROA	0.276*	0.267
	(0.162)	(0.163)
Dividend	0.102***	0.102***
	(0.022)	(0.022)
CEO Ownership	-0.106	-0.080
	(0.307)	(0.309)
BoD Ownership	-0.337***	-0.319**
	(0.130)	(0.130)
Hedging	0.041	0.201***
	(0.066)	(0.066)
High Foreign Ownership	-0.054	
	(0.067)	
Low Foreign Ownership		-0.027
		(0.069)
High Foreign Ownership x Hedging	0.188***	
	(0.072)	
Low Foreign Ownership x Hedging		-0.100
		(0.078)
Constant	1.469***	1.454***
	(0.187)	(0.187)
Observations	1403	1403
Number of firms	297	297

Note: The table shows regression models with the purpose to robust check Hypothesis 3. The variables High Foreign Ownership and Low Foreign Ownership are categorized based on the median of 0,291 for our original variable for Foreign Ownership. High Foreign Ownership is defined for all firms above the median, whereas Low Foreign Ownership is defined as all firms below the median. Both categories generate unique dummy variables, which is followed by the creation of the interaction terms High Foreign Ownership x Hedging and Low Foreign Ownership x Hedging.

Cluster-robust standard errors on firm id in parentheses

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

Appendix

Appendix A: Other and Non-Ongoing Disclosed Models in the Study.

Random Effects – Separated Hedging Derivatives (Hypothesis 1)

$$Tobin's\ Q\ (log)_{i,t} = \beta_0 + \beta_1 Currency\ Hedge_{i,t} + \beta_2 Interest\ Hedge_{i,t} + \beta_3 Commodity\ Hedge_{i,t} + \beta_4 Total\ Assets\ (log)_{i,t} + \beta_5 Debt\ to\ Assets_{i,t} + \beta_6 CAPEX\ to\ Sales + \beta_7 R\&D\ to\ Sales_{i,t} + \beta_8 ROA_{i,t} + \beta_9 Dividend_{i,t} + \beta_{10} CEO\ Ownership_{i,t} + \beta_{11} BoD\ Ownership_{i,t} + \beta_{11} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t \quad (4)$$

Pooled-OLS – Continuous Hedging Variable (Hypothesis 1)

$$Tobin's\ Q\ (log)_{i,t} = \beta_0 + \beta_1 Hedge\ Ratio_{i,t} + \beta_2 Total\ Assets\ (log)_{i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales_{i,t} + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 CEO\ Ownership_{i,t} + \beta_9 BoD\ Ownership_{i,t} + \beta_{10} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \epsilon_t \quad (5)$$

Random Effects – Continuous Hedging Variable (Hypothesis 1)

$$Tobin's\ Q\ (log)_{i,t} = \beta_0 + \beta_1 Hedge\ Ratio_{i,t} + \beta_2 Total\ Assets\ (log)_{i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales_{i,t} + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 CEO\ Ownership_{i,t} + \beta_9 BoD\ Ownership_{i,t} + \beta_{10} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \gamma\ year\ control_t + \vartheta_t \quad (6)$$

Pooled-OLS – CEO Ownership x Hedging Model (Hypothesis 2.1.)

$$Tobin's\ Q\ (log)_{i,t} = \beta_0 + \beta_1 Hedging \times CEO\ Ownership_{i,t} + \beta_2 Total\ Assets\ (log)_{i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 Hedging_{i,t} + \beta_9 CEO\ Ownership_{i,t} + \beta_{10} BoD\ Ownership_{i,t} + \beta_{11} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t + \epsilon_t \quad (8)$$

Pooled-OLS – BoD Ownership x Hedging Model (Hypothesis 2.2.)

$$Tobin's\ Q\ (log)_{i,t} = \beta_0 + \beta_1 Hedging \times BoD\ Ownership_{i,t} + \beta_2 Total\ Assets\ (log)_{i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 Hedging_{i,t} + \beta_9 CEO\ Ownership_{i,t} + \beta_{10} BoD\ Ownership_{i,t} + \beta_{11} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t + \epsilon_t \quad (10)$$

Pooled-OLS – Foreign Ownership x Hedging Model (Hypothesis 3)

$$Tobin's\ Q\ (log)_{i,t} = \beta_0 + \beta_1 Hedging \times Foreign\ Ownership_{i,t} + \beta_2 Total\ Assets\ (log)_{i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4\ CAPEX\ to\ Sales + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 Hedging_{i,t} + \beta_9 CEO\ Ownership_{i,t} + \beta_{10} BoD\ Ownership_{i,t} + \beta_{11} Foreign\ Ownership_{i,t} + \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t + \epsilon_t \quad (12)$$

Random Effects – Foreign Ownership x Currency Hedging Model (Hypothesis 3)

$$Tobin's\ Q\ (log)_{i,t} = \beta_0 + \beta_1 Currency\ Hedging \times Foreign\ Ownership_{i,t} + \beta_2 Total\ Assets\ (log)_{i,t} + \beta_3 Debt\ to\ Assets_{i,t} + \beta_4 CAPEX\ to\ Sales_{i,t} + \beta_5 R\&D\ to\ Sales_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Dividend_{i,t} + \beta_8 Currency\ Hedge_{i,t} + \beta_9 Interest\ Hedge_{i,t} + \beta_{10} Commodoty\ Hedge_{i,t}\ \beta_{11} CEO\ Ownership_{i,t} + \beta_{12} BoD\ Ownership_{i,t} + \beta_{13} Foreign\ Ownership_{i,t}\ \gamma\ industry\ control_{i,t} + \gamma\ year\ control_t + \vartheta_t \quad (14)$$

Appendix B: Example of Manually Collected Hedge Ratios from Annual Reports

NCC AB annual report 2018:

The following table shows the sum total of the Group's gross inflows and gross outflows of various currencies, the portion hedged during the year and the currency risk for each currency in the unhedged currency flows. The currency risk shows the change in profit for the year should the SEK exchange rate change by 5 percent in relation to every single currency due to losses from the translation of unhedged accounts payable/accounts receivable.

	2018				2017			
Counter-value in SEK M	Gross in and outflows	Of which, expired hedges	Hedged portion, %	Currency risk 5% after tax on unhedged share	Gross in and outflows	Of which, expired hedges	Hedged portion, %	Currency risk 5% after tax on unhedged share
EUR	2,210	1,607	73	24	1,633	1,119	69	20
DKK	269	54	20	8	258	60	23	8
NOK	245	101	41	6	266	118	44	6
PLN	153	142	93	0	153	127	83	1
Other	42	38	89	0	52	25	49	1
Total	2,919	1,942	67	38	2,361	1,450	61	36

The forward contracts used to hedge contracted and forecast transactions are classified as cash flow hedges. During 2018, no cash flow hedges were closed, because it was no longer probable that the expected cash flow would be achieved.

Trelleborg AB annual report 2018:

Currency distributions, degree of hedging and sensitivity analysis per December 31, 2018

Currency	Net investment, SEK M	Currency hedging, %	Effect on equity, if SEK 1% stronger, SEK M
EUR	15,000	58	–81
GBP	2,228	28	–17
USD	4,532	37	–32
CZK	10,348	25	–83
Other	9,765	11	–89
Total 2018	**41,873**	**35**	**–302**
Total 2017	38,571	33	–286

The Group's positions regarding hedging of investments in foreign subsidiaries are regularly monitored and adjusted. Correlations between currencies are taken into consideration when appropriate.

Nolato AB annual report 2017:

Foreign exchange risk The risk that fluctuations between different currencies will have a significant negative impact on Nolato's performance and earnings. This risk consists of transaction exposure, which derives from buying and selling in different currencies, and translation exposure, which derives from the translation of foreign subsidiaries' assets, liabilities and earnings to Swedish kronor.	Estimated net flows in foreign currency amounted to SEK 239 million at year-end, 44% of which was hedged. This means that SEK 133 million of estimated net flows were unhedged and a change in the value of the Swedish krona of +/–5% would have an impact of SEK 7 million on Group profit. The Group has SEK 998 million in foreign net assets, mainly in China, Hungary and the UK. A 5% appreciation in the Swedish krona would have an impact of SEK 50 million on the net assets in the Group.	Nolato carries out short-term currency hedging for part of the Group's estimated net exposure in foreign currencies in order to even out fluctuations in earnings. See the table in Note 28 on page 76.