Determinants of Segment Reporting Quality and Quantity Under IFRS 8 – Nordic Evidence

The Role of the Nordic Model and Other Factors on Operating Segment Disclosure

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Master Thesis
Stockholm School of Economics
2025

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Abstract

As part of its convergence project with FASB, IASB introduced the reporting standard IFRS 8 *Operating Segments* in 2006, which came into effect for the fiscal year beginning on or after 1st of January 2009. The new standard adopted the management approach, leading to notable changes in how companies can define their segments and what information they are required to disclose. Using a sample of 294 Nordic listed companies by the end of 2009, we examine potential determinants of segment reporting choices and their impact on the information environment for external users under IFRS 8. Additionally, we investigate whether the unique features of the Nordic corporate landscape, such as the presence of ownership spheres, impact companies' segment disclosures under the management approach. Our empirical results show support for traditional determinants, such as firm size. However, we find no support that managers shape their disclosure strategy for segment reporting due to proprietary and agency cost concerns. Nor do we find any evidence for a negative relationship between ownership concentration and the level of segment disclosure. In terms of impact on the information environment, we noted the unexpected observation that both over- and under-disclosers reported lower forecast errors, which is opposite to previous research.

Keywords: IFRS 8; Segment reporting; Management approach.

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Master Thesis
Master Program in Accounting, Valuation and Financial Management
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Acknowledgements

We would like to express our sincere gratitude to our supervisor Niclas Hellman for his valuable support, guidance and insightful advice throughout the thesis writing process. His encouragement and expertise within accounting have played a vital role in the writing of this thesis.

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1. Introduction

The Nordic corporate landscape presents a distinctive governance and ownership structure that sets it apart from many other developed economies. Central to the distinctiveness is a corporate governance model that allocates considerable power to majority shareholders, coupled with generally high ownership concentration (Cronqvist & Nilsson, 2003; Lekvall, 2014). In countries such as Sweden, the concentrated ownership is commonly represented by long-term family or industrial investors referred to as "owner-spheres", like the Wallenberg family or Handelsbanken-sphere (Collin, 1993; Fristedt & Sundqvist, 2009; Sjöstrand et al., 2016).

Owner-spheres often establish dominance not just through capital ownership, but via sophisticated structures such as dual-class shares with enhanced voting rights, pyramidal crossholdings, and strategic inter-corporate alliances (Cronqvist & Nilsson, 1999). In Table IV La Porta (1999), Sweden was the only country in the sample of 27 developed markets that ranked among the top-three countries in all of the categories for the use of i) dual-class shares, ii) pyramidal ownership and iii) cross-shareholding. These arrangements allow them to exert control over large corporate groups with relatively modest capital investment (Collin, 1993; Agnblad et al., 2002; Fristedt & Sundqvist, 2009). In addition, these owner-spheres often have networks of CEOs and board members across their portfolio companies, what Collin (1993) refers to as the "brotherhood of the Swedish spheres". These networks of senior executives allow the owner-sphere to expand their influence beyond financial control vis-à-vis other shareholders (Collin, 1993; Agnblad et al , 2002).

In this context, emerged a pivotal shift in financial reporting regulation: the introduction of IFRS 8 *Operating Segments* in 2009. Unlike its predecessor IAS 14R, IFRS 8 employs the "management approach", whereby firms are required to disclose operating segments based on the internal reporting structure reviewed by the chief operating decision maker (CODM) (IASB, 2006). The rationale behind this reform was to enhance the relevance of financial information to external users such as investors, analysts and regulators (IASB, 2006). By aligning the segment reporting with the internal organisational view, IFRS 8 seeks to provide a more accurate reflection on how management assesses the various segments of the business (Nichols et al., 2012; Crawford et al., 2012).

However, adopting the management approach shifts significant discretion into the hands of management, particularly in defining what constitutes a segment, determining the aggregation of segments, and shaping the reported metrics for each (IASB, 2006). In this context, the centrality of the CODM becomes more pronounced, making the segment reporting choice conditioned on who this person is identified as internally (Nichols et al., 2013; André et al., 2016; Gisbert et al., 2024). Importantly, in firms where management is subject to clear influence and control by a majority shareholder, these controlling owners may find themselves with newfound, indirect power over external financial disclosures. In this way, IFRS 8 arguably amplifies the role of dominant owners, such as owner-spheres, allowing them to shape financial reporting via managerial influence.

Accordingly, an important question that arises is whether controlling shareholders, such as owner-spheres, impact operating segment disclosure under IFRS 8, and, if so, whether this shapes the information environment of external users? In this study, we set out to examine what factors impact segment reporting under IFRS 8 in the Nordic context, including the unique features of the Nordic corporate landscape. To assess whether segment disclosure strategies have practical implications on companies' information environment, we examine potential relationships between segment disclosure characteristics and analysts' earnings forecast errors.

Given the pronounced ownership concentration in the Nordic region and the prevalence of long-term controlling owners, we hypothesise that the Nordic model limits segment information disclosure as a result of Type II agency costs. According to this theory, concentrated ownership structures may give rise to conflicts of interest between controlling and non-controlling shareholders, as controlling shareholders try to make benefits at the expense of the non-controlling owners. To avoid agency conflicts, the majority shareholder increases information asymmetry towards minority shareholders (Shleifer & Vishny, 1997; La Porta et al., 1999; Pagano & Röell, 1998). Empirical studies have shown that concentrated ownership tends to reduce earnings informativeness and increase earnings management due to Type II agency costs (Fan & Wong, 2002; Cronqvist & Nilsson, 2003; Yang, 2010). With the clear presence of dominating shareholders, Nordic firms may have incentives to withhold segment information from minority owners to avoid agency costs. Under IFRS 8, they should have a greater ability to do so as well, as they can shape segment disclosure by exercising influence over the CODM.

Building on the methodology of André et al. (2016), segment reporting quantity is measured as the number of segment line items disclosed in the segment note of the annual report. Segment reporting quality, by contrast, is measured as cross-segment profit variability. A firm trying to smooth earnings would report lower cross-segment profit variability, hence carry lower informational value to an external user (Ettredge et al., 2006; André et al., 2016). Together, these two dimensions provide indication on the firms' segment disclosure choices.

To the best of our knowledge, this study offers three main contributions to the literature on IFRS 8 and the management approach. First, it provides a focused analysis of the Nordic region, addressing potential regional differences. Given that prior research does not address country or regional differences (André et al., 2016), combined with previous research calling for studies on "national flavours" in adopting segment reporting standards (Nichols et al., 2013), local adaptation merits closer examination. Second, our sample covers a broader range of firm sizes than prior studies, which have typically focused on European blue chips (Nichols et al., 2012; André et al., 2016; Aboud et al., 2018). Because smaller firms experience different disclosure constraints, especially in segment aggregation, firm size is a relevant factor to consider. Third, we explore the link between ownership structure and segment disclosure, as well as how the information environment is shaped by the influence of dominant shareholders. This remains a relatively unexplored area in the segment reporting literature.

The remainder of this paper is organised in the following way. Section 2 provides a historical background to segment reporting. Section 3 provides a theoretical background and an overview of prior research in the field. Thereafter, Section 4 develops our hypotheses. Section 5 reports the research design and sample selection process, as well as descriptive statistics. Section 6 presents the primary analysis of our study, focusing on the determinants of segment reporting practices. Section 7 concludes the findings from our primary analysis, explains limitations and provides suggestions for further research on segment reporting.

2. Institutional Background to *IFRS 8 Operating Segments*

In 1981, the IASB issued its first accounting standard on segment reporting: The International Accounting Standard (IAS) 14. The IAS 14 standard required firms to disclose revenue, results and assets both for line-of-business (LOB) and geographic segments (IASC, 1981). Segments representing LOB consisted of products and services of similar risk and return, meanwhile, geographical segments were based on geographical markets (IASC, 1981). To justify the new segment reporting standard, IASB stated in IAS 14 the following rationale:

> Rates of profitability, opportunities for growth, future prospects, and risks to investments may vary greatly among industry and geographical segments. Thus, users of financial statements need segment information to assess the prospects and risks of a diversified enterprise which may not be determinable from the aggregated data. The objective of presenting information by segments is to provide users of financial statements with information on the relative size, profit contribution, and growth trend of the different industries and geographical areas in which a diversified enterprise operates to enable them to make more informed judgments about the enterprise as a whole

However, although the goal was to improve the information environment by enhancing firms' segment reporting, the IAS 14 standard was criticised by many. In particular, the main critique against IAS 14 related to the imprecision and perceived management discretion in presenting segment information under the new standard (Prather-Kinsey & Meek, 2004). Following the criticism, IASB decided to issue the revised version IAS 14R in 1997, which came into effect the following year (IASC, 1997). IAS 14R introduced two-tier segmentation in the form of a primary and secondary segment. Thus, under IAS 14R, companies designated either LOB or geographical segments as the primary basis for reporting, with the other serving as the secondary basis with lower disclosure requirements (IASC, 1997). The determination of the primary and secondary segments was based on whether the entity's risks and returns were affected by the products and services it produced, or by the fact that it operated in different geographical areas (IASC, 1997). In addition, IAS 14R required additional segment items to be reported for primary segments, such as internal/external revenue, operating profit, capital expenditures and depreciation & amortisation. (IASC, 1997). The overall objective of IAS 14R was therefore to provide more detailed guidance on defining operating segments, discourage the improper aggregation of dissimilar segments and increase the number of segment line items reported (Nichols & Street, 2007).

In 1997, the same year as IASB published IAS 14R, the Financial Accounting Standards Board (FASB) in the United States issued SFAS 131. The SFAS 131 standard, which is still in effect for companies applying US GAAP, mandates that externally reported operating segments are identified based on the "management approach" instead of the previous industry approach (FASB, 1997). The management approach differs from the industry approach as reported segments are defined based on the different business units reviewed internally by the chief operating decision maker (CODM) when evaluating performance and allocating resources (FASB, 1997). By adopting the management approach, FASB aimed to align external reporting with the firm's internal organisational structure, thereby improving external users' insights (FASB, 1997). As part of its convergence project with the FASB (IASB & FASB, 2006), the IASB decided in 2006 to replace IAS 14R with IFRS 8 (IASB, 2006). The new standard was closely modelled on FASB's SFAS 131, hence also adopting the management approach (IASB, 2006). According to the IASB (2006), segment reporting based on IFRS 8 defines segments in the following way:

> Identification of operating segments [shall be made] on the basis of internal reports that are regularly reviewed by the entity's chief operating decision maker in order to allocate resources to the segment and assess its performance.

With the introduction of IFRS 8, companies that previously reported in accordance with IAS 14R moved away from the two-tier segment structure to report in accordance with the CODM's internal view of the organisational structure (IASB, 2006). Instead of introducing formal requirements on what measurement basis to use and what accounting items to disclose, the new standard is principle-based. Thus, the stated purpose of IFRS 8 is to provide external users with the internal perspective on the operating segments of the organisation, with operating segments defined by how the CODM reviews performance and allocates resources (IASB, 2006). Since the only mandatory disclosure requirement for each segment is a profit/loss measurement, meanwhile other accounting items are only reported if the CODM reviews them regularly (IASB, 2006), the management has obtained a new central role in segment reporting following IFRS 8. Depending on how the CODM is defined by the reporting company, the subsequent requirements on what segment data needs to be communicated change. Furthermore, IFRS 8 does not clearly define who the CODM is. Instead, this is determined individually by each company (IASB, 2006).

The transition to IFRS 8 and the management approach brought changes to the segment reporting requirements (Véron, 2007; Crawford et al., 2014). Firms faced adjustments in three key areas: segment identification, measurement principles and line items to report (IASB, 2006). Compared to IAS 14R, the new standard requires preparers to report segments in accordance with the internal organisational structure defined by the CODM. In addition, the reported measurements such as revenue, profit and assets are no longer required to be presented according to the measurement principles of IFRS but shall instead be presented the same way as when reviewed internally, which may be on non-IFRS measurement basis. Lastly, the preparers are only obligated to disclose items reviewed by the CODM when evaluating performance whereas IAS 14R required disclosure of the certain set of line items mentioned

above. Meanwhile IAS 14R defined each of the line item to be calculated and presented, IFRS 8 asks for an explanation on how segmental assets and results are measured (IASB, 2006). For a complete comparison between IAS 14R, IFRS 8 and SFAS 131 please see Table A in Appendix.

Although being released in 2006, IFRS 8 did not come into effect until the fiscal year beginning on or after 1st January 2009 (IASB, 2006). Despite the attempt to make segment reporting more useful, the IASB received criticism regarding the new standard from practitioners and the European Union. The new standard resulted in a highly politicised debate and power struggle between IASB and the EU (Véron, 2007; Crawford et al., 2014). Regardless of the arguments presented by the IASB in favour of the management approach, such as i) international harmonisation, ii) the ability for users to understand the firm from the management perspective, and iii) empirical studies from the U.S context in favour of the management approach (IASB, 2013), there were concerns regarding implementing the management approach, among others.

Firstly, the EU was concerned about that new standard being closely modelled on SFAS 131 as adopting IFRS 8 would result in directly importing a US standard into EU law (Nichols et al., 2012). Secondly, the EU was also critical towards the management approach since it meant moving away from a unified definition of operating segments and allowing non-IFRS measures (Véron, 2007; Crawford et al., 2012). In addition, users expressed concerns regarding IASB not providing a standardised definition of who the CODM is (IASB, 2013). Due to the lack of definition of the CODM, companies have defined it differently, resulting in significantly different segment disclosures between firms (Ammar & Mardini, 2021). Hence, there were shared concerns that adopting IFRS 8 would impair the reliability and comparability of companies' segment disclosures compared to the predecessor IAS 14R (Véron, 2007).

To drive the adoption of IFRS 8 forward, IASB committed to the EU to perform a post-implementation review (PIR), which was the first PIR ever (IASB, 2013). Four years after the implementation, the PIR concluded that preparers generally approved the new standard, meanwhile users still had diverging opinions on the usefulness of the management approach. Critics of the standard still claimed mistrust of the faithfulness of segment data reported and the decreased comparability between firms (IASB, 2013).

3. Theoretical Background and Prior Research on IFRS 8

The following section begins by introducing the theoretical frameworks central to this study. Thereafter, relevant prior research on segment reporting is presented, highlighting both the core literature on adopting the management approach and more focused studies on the determinants influencing the quality and quantity of IFRS 8. Lastly, the chapter explores prior research examining the usefulness of segment reporting for external users.

3.1 Theoretical Background

As mentioned in the introduction, we aim to contribute to existing research by targeting a new setting where we can examine what different factors impact segment reporting quantity and quality under IFRS 8, with emphasis on the impact of the dominant Nordic model. In order to perform an in-depth analysis of possible determinants, we have adopted a theoretical framework consisting of the following theories: proprietary cost theory and agency theory.

The proprietary cost theory (Verrecchia, 1983; Dye, 1985; Darrough & Staughton, 1990) posits that companies limit voluntary disclosure when competitors and other parties may use the information to disadvantage the firm. Verrecchia (1983) demonstrates through an analytical model that when proprietary costs are present and information is withheld, the market remains uncertain about the reasons for nondisclosure. The market cannot determine whether the company is withholding information because it constitutes 'bad news' or simply because the information is not sufficiently positive to justify the costs of disclosure. Firms may not always disclose all available information to external users of the financial statements, although it could reduce information asymmetry and thereby lower the cost of capital. The theory suggests that disclosing commercially sensitive information may cause competitive disadvantages greater than the benefits from reduced information asymmetry (Verrecchia, 1983; Dye, 1985). Adding to this, Darrough and Stoughton (1990) also concluded that as the number and size of competitors for the firm increase, the voluntary disclosure of proprietary information is disincentivised. Segment reporting by definition shall give details about the size, profitability and growth of a firm's different lines of business. To competitors, customers, or suppliers, this data can indicate potential weaknesses or opportunities that they can seek to exploit. This highlights the link between proprietary cost concerns and segment reporting.

Throughout the paper, we will also build the analysis around agency theory. From Jensen and Meckling's seminal paper on agency theory (1976), it follows that a principal-agent problem arises through the separation of ownership and control. Although managers are intended to act on behalf of the owners, they might sometimes be incentivised to act in their own interest instead, diverging from the owners' interests. This problem has also been referred to as Type 1 agency cost (Gilson & Gordon, 2003; Villalonga & Amit, 2006; Ali et al., 2007). In relation to segment reporting, agency costs of Type 1 may arise as managers have incentives to withhold information about poor development of a segment to present their own performance in a better light (Berger & Hann, 2007, André et al., 2016). Another type of agency conflict arises between controlling and non-controlling shareholders (Gilson & Gordon, 2003). A dominant shareholder may leverage its controlling position to extract private benefit from the firm at the expense of other minority interests (La Porta et al., 1999; Gilson & Gordon, 2003; Villalonga & Amit, 2006). Such private benefits may come from freezing out minority shareholders (Gilson & Gordon, 2003), engaging in related-party transactions (Anderson & Reeb, 2003) or managerial entrenchment (Shleifer & Vishny, 1997). The following sections on prior research will discuss research findings in relation to segment disclosure, agency and proprietary costs.

3.2 Prior Research on IFRS 8

3.2.1 Segment Reporting Quantity Under the Management Approach

As companies prepare their segment reporting data, managers must decide how to define their segments and which segment line items to report (André et al., 2016). Building on this, several studies have documented the development in companies' segment reporting practices across different accounting standards and countries. Below, we present a summary of the findings relevant to IFRS 8 and the management approach.

Impact on SFAS 131 Companies

One of the first studies on the impact of SFAS 131 was conducted by Street et al. (2000). In their study, Street et al. (2000) investigated how the adoption of SFAS 131 impacted the number of segments and segment line items reported by looking at a sample of 160 US companies. The authors find that a majority of the firms have increased their number of LOB segments reported, and the increase in the average number of operating segments was significant. In addition, the number of firms reporting only one segment decreased under the new standard. However, although observing an increase in the number of line items reported after adopting SFAS 131, the increase was considered marginal (Street et al., 2000). Herrmann & Thomas (2000) carried out a similar study but focused on the 100 largest American companies instead. They found that half of the sample disclosed additional segments and segment line items following the adoption of SFAS 131. Consistent with Street et al. (2000), the increase in the average number of segments disclosed was significant. These results are supported when looking at larger samples of US companies as well, providing additional evidence of single-segment firms converting into multi-segment firms following SFAS 131 (Berger & Hann, 2003; Ettredge et al., 2006). In summary, US studies on the adoption of SFAS 131 note an increase in the number of segments reported per firm, partly explained by a notable reduction in the number of firms reporting a single-segment. Additionally, these studies suggest that SFAS 131 led to an increase in the number of items reported per operating segment.

Impact on IFRS 8 Companies

Focusing on the European context, multiple studies have found that the implementation of IFRS 8 did not lead to an increase in average number of reported segments, meanwhile the number of accounting line items disclosed per segment significantly decreased, which questions the overall impact on informativeness of the new standard (Nichols et al., 2012; Pisano & Landriana, 2012; Kang & Gray, 2013; Crawford et al., 2014; Franzen & Weißenberger, 2015; Gisbert et al., 2024). Based on a sample of 335 European blue-chip firms, Nichols et al. (2012) find that the average reported number of segments in the sample increased marginally under IFRS 8 (from 3.84 to 4.19), however the majority of firms (62%) reported the same number of segments. Focusing on the UK context, Crawford et al. (2012) examined the impact of IFRS 8 on a sample of FTSE 250 and FTSE 100 companies. Consistent with the results presented by Nichols et al. (2012), the authors observed a significant increase in the average number of segments but a decrease in the average amount of segment line items

reported. Interestingly, the authors noted that several companies in the sample had pulled back segment-level details on items like capital expenditure, liabilities and geographical split of total assets following adopting IFRS 8.

In their study on Italian companies, Pisano & Landriana (2012) observed a significant increase in the average number of reported segments under IFRS 8, however a vast majority of the 91 firms in the sample did not report any change in their number of segments. Franzen & Weißenberger (2015) witnessed similar evidence for the German market. With a sample of 82 German firms, the authors concluded that the increase in the average number of reported segments was significant however 80% of the sample reported the same number of segments. In addition, German firms reported fewer accounting items per segment following the adoption of IFRS 8. Turning to the Spanish study by Gisbert et al. (2024), the authors examined IFRS 8 impact on a sample of 76 Spanish firms. Similar to the other studies above, a majority of firms did not change the number of segments reported with an insignificant change in the average number of segments reported. Interestingly, the change in the number of segment items was also insignificant.

Comparing the results from studies on IFRS 8 and SFAS 131 yield different conclusions. In the US setting, the literature has noted an overall increase in both the average number of segments reported and in the number of line items per segment. In contrast, under the IFRS 8 setting, most empirical studies show that many firms did not change the number of segments reported and actually decreased the average number of disclosures per segment (Nichols et al., 2013). These findings are consistent with the concerns raised by critics of the new IFRS 8 standard, that conditioning disclosure on what is reported to the CODM could have unfavourable effects on the quantity of segment reporting data (IASB, 2013).

3.2.2 The Determinants of Segments Reporting

In their 1996 paper, Hayes and Lundholm show that the appropriate level of segment aggregation is a trade-off between informing the capital market about the firm's value and disclosing commercially sensitive information that could aid competitors at the firm's expense. Related to this finding, several studies have examined the incentives and disincentives that may explain the level of a firm's segment disclosure. Previous studies have observed significant relationships between segment disclosure quality and certain firm attributes such as size (Harris, 1998; Nichols & Street, 2007), business complexity (Wang et al., 2016) and market liquidity (Botosan & Harris, 2000). The two main reasons brought forward in the existing literature for aggregating segment information are proprietary cost concerns and agency cost problems. Proprietary cost concerns posits that managers aggregate segment information in a way that is effective to avoid disclosing commercially sensitive information. Agency cost hypothesis posits that managers may aggregate segments to mask poor performance by blending it together with other better performing segments (André et al., 2016).

Determinants under SFAS 131

Focusing on US firms, previous studies report empirical evidence suggesting managers are less likely to disclose information on operations in less competitive industries (Harris, 1998; Botosan & Stanford, 2005). Etteredge et al. (2002) find a positive, significant relationship between a company's lobbying against SFAS 131 and the bargaining power of that company's customers. The authors posit that managers of these companies likely believed that the new disclosures under SFAS 131 would increase the bargaining power of their customers further. Leveraging U.S. census data, Bens et al. (2011), find that both agency and proprietary concerns impact segment disclosure, and that for single-segment firms, proprietary concerns are most important. Wang et al. (2011) note that firms protected with barriers to entry are likely to disclose more variability in segment earnings growth – a proxy for the quality of segment reporting. Analysing SEC comment letters, Wang et al. (2016) also observe a significant positive relationship between industry concentration and segment disclosure deficiencies raised by the SEC.

Determinants under IFRS 8

Focusing on an international and non-US setting, Nichols & Street (2007), observe a significant negative relationship between segment aggregation and company ROA in excess of industry returns, further suggesting that industry competition impacts disclosure levels. Studying Australian firms switching to the management approach under IFRS 8, Bugeja et al. (2015) observe that firms with decreasing line-item information post IFRS 8 generally had fewer loss-making segments and operated in more concentrated industries. Studying the first-time adoption of segment reporting in Germany, Leuz (2004) notes that firms having greater variability in cross-segment profitability, were less likely to report segment items when they were voluntary. The author posits that for these firms, the average profitability in the consolidated income statement is less informative about segment profitability, making segment disclosure more revealing and commercially sensitive which would support the proprietary cost concern for aggregating segment data. Examining European blue-chip firms, André et al. (2016) find that managers appear to solve proprietary concerns by either reducing the quantity of segment information provided or decreasing the quality of the data. While focusing on geographic segment information, Aleksanyan and Danbolt. (2015) observe that firms define geographic segments in broader terms under IFRS 8 compared to the predecessor standard. The authors note that while this may have solved the proprietary cost concerns, it may have simultaneously reduced the usefulness of the information to the external users.

3.2.3 Segment Reporting's Impact on the Information Environment of External Users

In interviews with financial analysts, segment performance data has been pointed out as the most useful section in financial reports followed by the three financial statements (Epstein & Palepu, 1999). When IFRS 8 was drafted back in 2006, the IASB argued that the new standard would improve relevance (IASB, 2013) which in turn could enhance analysts' and investors' ability to make accurate forecasts. Below follows a review on some of the literature examining the impact of the management approach on analysts' information environment.

Looking at prior research in the US context, the results on the impact on financial analysts' forecast ability remain divided. Multiple studies find lower analysts' forecasting errors after the implementation of SFAS 131, implying that the management approach improved the information environment for financial analysts (Behn et al., 2002; Berger & Hann, 2003; Blanco et al., 2015). Adding to that, Ettredge et al. (2006) provide supplementary evidence arguing that the management approach enabled not only financial analysts but also investors to make better predictions of future earnings. At the same time, a few studies are pointing in the opposite direction. Botosan & Stanford (2005) argue in their study that the earnings forecasting accuracy is only better for first-time reporters, suggesting no persistence in the improved forecasting accuracy under the management approach. In addition, Park (2011) poses evidence that the adoption of the management approach under SFAS 131 has not improved external users' ability to predict firm-specific earnings. Thus, the impact of the management approach on the information environment in the U.S. context remains unclear.

Under an IFRS setting, André et al. (2016) observe that the number of accounting items disclosed per segment impacts the usefulness of IFRS 8 segment reporting from a financial analyst's perspective. According to the study, companies that disclose above or below average segment quantity experience higher earnings forecasting errors. The authors explain the non-linear results as if under-disclosing segment line items results in information asymmetry, meanwhile over-disclosing accounting line items creates noise (André et al., 2016). Similar evidence with respect to unchanged information asymmetry was also observed by Franzen & Weißenberger (2018), who analysed whether German firms experienced a decrease in information asymmetry post IFRS 8 adoption. Although firms had adopted IFRS 8, the authors did not witness any reduction in bid-ask spreads nor in forecasting errors (Franzen & Weißenberger, 2018). On the other hand, Kajüter & Neinhaus (2017) observed an improvement in value relevance under IFRS 8 compared to under IAS 14, suggesting this benefit outweighed the decrease in comparability.

A controversial aspect of IFRS 8 allowed firms to report segment data on a non-IFRS measurement basis (Crawford et al., 2014, IASB, 2013). Exploring the impact of the use of non-IFRS data, Göttsche et al. (2021), find evidence when studying a sample of multi-segment European firms, that non-IFRS segment data lead to less accurate analyst forecasts and a higher forecast dispersion. Overall, the impact on analysts' forecast ability remains divided in the literature. Meanwhile several empirical research articles in the US context claim that the information environment for sophisticated users benefited from the management approach, researchers in the international context have not found the same support for the new standard.

3.3 Ownership Structure Impact on Financial Reporting

This section reviews prior studies that examine how ownership structure influences financial reporting quality and firm performance. Each study focuses on a different context but collectively they address how concentrated ownership may introduce distinct agency problems

in firms. The studies employ various empirical approaches to assess how agency costs manifest in earnings quality, disclosure practices and firm valuation.

In their study from 2007, Ali et al. examine if family-firms report higher quality earnings than non-family firms included in the S&P 500. The authors hypothesise that while family firms experience fewer agency issues stemming from the separation of ownership and management (Type I agency problems), they are more prone to agency conflicts between controlling and minority shareholders (Type II agency problems). Family firms are categorised in the sample based on BusinessWeek's article on family firms in S&P500; resulting in 177 family firms and the rest as non-family. The authors find evidence suggesting family firms exhibit less positive discretionary accruals and are more likely to warn of bad news, suggesting better disclosure compared to non-family firms. However, when dividing the family-firms sample into groups of firms with and without dual-class share structures, they note that the disclosure quality decreases for family firms with dual-class shares. Compared to non-family firms, the authors note that it is family firms without dual-class share structures that primarily drive the improved disclosure quality compared to non-family firms. The use of dual class-shares seems to emphasise the agency problems contributing to the observed difference in disclosure practices between family and non-family firms (Villalonga & Amit, 2006; Ali et al., 2007).

Fan and Wong (2002) examine how ownership structure impacts company disclosure amongst East Asian firms. Aligned with Ali et al. (2007), the authors argue that firms with a controlling shareholder experience a shift in the agency problem, away from manager-shareholder conflicts to conflicts between the controlling and non-controlling shareholders. Furthermore, the authors claim that the entrenchment effect of the concentrated ownership spills over into the financial reporting, causing lower credibility and quality of reported earnings as the financial reporting is manipulated. The study also notes that it is common for controlling owners in East Asian companies to gain control by acquiring sufficient voting rights, usually disproportionate to the capital ownership. The findings reveal a significant negative relationship between ownership concentration and earnings quality. Because the market knows that the controlling owner can influence the company's accounting reporting policies, and is incentivised to report out of self-interest, Fan & Wong (2002) note that the market also expects the disclosures to be of lower quality.

Yang (2010) examines family-owned firms in Taiwan and observes a positive association between the degree of insider ownership and discretionary accruals. The author notes that this could be one way in which family firms may decrease earnings quality in order to expropriate the interest of minority shareholders. Prior studies have examined the relationship among ownership structure, discretionary accruals and the informativeness of earnings (Sánchez-Ballesta & García-Meca, 2007), noting a non-linear association between insider-ownership and discretionary accruals in what looks like a U-shape. Below a certain level of ownership concentration, Agency Type 1 costs arise between management and the shareholders. Over a certain level of ownership, shareholders become entrenched and the relation with discretionary accruals increases again (Sánchez-Ballesta & García-Meca, 2007).

In a study on 309 Swedish listed firms between 1991 and 1997, Cronqvist and Nilsson (2003) estimate the agency costs among a group of firms owned by "controlling minority shareholders" (CMS) - a type of shareholder that has control over a firm's votes, while owning a minority of the cash flow rights. Cronqvist and Nilsson (2003) note three significant results from their study. First, family-owned firms are more likely to employ CMS structures, primarily via dual class share compared to other ownership categories. Secondly, after adjusting for firm characteristics and fixed effects, the authors note a significant negative relationship between Tobin's Q (a proxy for firm value) and vote ownership by controlling owners. The estimated discount (agency cost) ranges from 6 to 25%, with the largest discounts being associated with family CMS. Thirdly, the authors suggest that the identified discount can be explained, partly by firms with concentrated voting control being associated with lower ROA, and partly because family CMS are 50% less likely to be acquired compared to other firms, suggesting the market for corporate control is not working as well.

4. Hypothesis Development

In this section, we first discuss how proprietary- and agency cost concerns relate to managers' choice of segment disclosure quality and quantity. Building on this, we then discuss how the ownership model in the Nordics may influence segment reporting quality and quantity, linked to agency costs. The section then ends with a formulation on how external users are impacted by the quality and quantity of segment disclosure provided.

4.1 Determinants of Segment Disclosure Quantity and Quality

Proprietary Cost Concerns as Determinant of Segment Reporting

As highlighted in the theoretical background, the Proprietary cost theory posits that a company might withhold information if disclosing it could potentially cause competitive disadvantages (Verrecchia, 1983; Dye, 1985; Hayes & Lundholm, 1996). Therefore, companies could have incentives to conceal certain information in their external reporting, consequently causing information asymmetry. Thus, the Proprietary cost theory implies that financial reporting is a carefully calibrated decision rather than a simple obligation (Verrecchia, 1983; Dye, 1985).

Since segment reporting under IFRS 8 is based on the management approach, the company gains additional discretionary power over deciding what information to include in the external reporting. As the segment information provided in the segment note becomes available for external users, the quantity dimension of segment reporting is considered a highly visible characteristic (André et al., 2016). Just by reading the note and comparing the number of accounting items disclosed with the recommendations in the standard, users can gain an understanding of the management's willingness to share segment information externally. By understanding how outsiders analyse and interpret the segment reporting quantity, managers can thereby decrease the perceived information asymmetry by at least providing the line-item information suggested in the standard (André et al., 2016). On the other hand, the quality of segment reporting, defined as the level of aggregation of operating segments, is less visible. As

an outsider, there is no possibility of accurately verifying the aggregation of segments without accessing the company's insider information. (André et al., 2016).

According to prior literature, managers are concerned that providing too detailed segment disclosures could hurt their competitive position (Hayes and Lundholm, 1996; Bens et al., 2011; Wang et al. 2011; André et al., 2016). By disclosing too many accounting items in the segment note, management fears competitors could gain access to sensitive details about their business and exploit them to strengthen their own competitiveness. Management may also fear that too detailed segment information disclosure attracts new entrants to the industry, further increasing competition (Bens et al., 2011; Berger & Hann, 2007). At the same time, management is aware that segment reporting quantity reduces information asymmetry, which is followed by lower cost of capital (Leuz, 2004). This dichotomy of outcomes demonstrates the potential proprietary cost concerns managers face in their choice of segment reporting (Verrecchia, 1983; Aleksanyan & Danbolt, 2015; André et al., 2016; Gisbert et al., 2024).

Additional research on the US context supports the arguments presented above, as these studies reveal that companies operating in concentrated industries disclose fewer details in their segment reporting due to higher proprietary costs concerns (Harris, 1998; Botosan & Harris, 2000; Botosan & Standford, 2005; Pisano & Landriani, 2012). Thus, to mitigate proprietary costs, managers seem to reduce the number of segment-level line items, enabling the manager to mask segment profits potentially. Additionally, managers may improperly aggregate operating segments into reportable segments to mask the performance and business model, indicating that the segment reporting quality is also shaped by proprietary cost concerns (André et al., 2016). Thus, we aim to examine whether proprietary cost concerns have an impact on segment reporting quality and quantity after the adoption of IFRS 8, leading to the hypothesis:

H1a: Higher (lower) proprietary costs are related to lower (higher) segment disclosure quantity/quality.

Agency Cost Concerns as Determinants of Segment Reporting

As outlined in the theoretical background, Jensen & Meckling (1976) laid the foundation for the initial agency theory which focuses on the agency costs from the separation of ownership and control (Type I agency cost). Agency theory posits that the separation of ownership and control might cause a conflict of interest between the owners (principal) and the management (agent), as the managers may not always act in the best interest of the owners. The costs therefore stem from the need to monitor the managerial behaviour, implement performance-based incentives but also bear the residual loss from suboptimal decisions (Jensen & Meckling, 1976).

From a Type I agency cost perspective, detailed segment reporting may reveal that the management does not operate the company based on a favourable strategy aligned with the shareholders' interest (André et al., 2016). Segment reporting gives shareholders a clearer insight into how the business areas are developing, which can serve as a basis for evaluating managers’ performance. This gives rise to potential agency problems as managers therefore

may be incentivised to mask negative outcomes in the operating segment (André et al., 2016; Gisbert et al., 2024). Thus, we aim to examine whether Type I agency cost has an impact on segment reporting quality and quantity, leading to the following hypothesis:

H1b: Higher (lower) agency costs are related to lower (higher) segment disclosure quantity/quality.

4.2 Nordic Corporate Governance Model

In examining the Nordic corporate landscape, Lekvall (2014) notes a generally high degree of ownership concentration. This aspect raises important questions about governance structures within these nations. When a comparative analysis is conducted regarding the corporate governance frameworks of the four Nordic countries – Sweden, Denmark, Norway and Finland – Lekvall (2014) concludes that these countries resemble each other to such an extent that it is warranted to talk about a collective Nordic corporate governance model. Two key distinguishing characteristics of this Nordic model are the level of centralisation of power granted to majority shareholders, and the non-executive board. This in turn allows the majority shareholder to exert substantial control over both the company and its non-executive board members (Lekvall, 2014). However, the implications of this power distribution come with risks; notably, there is the potential for the controlling shareholder to exploit their position to pursue personal interest at the detriment of minority shareholders, also referred to as a Type II agency problem (Fan & Wong, 2002; Cronqvist & Nilsson, 2003; Ali et al., 2007; Yang, 2010) This should presumably become more evident under the management approach, where dominant owner can influence managers.

The concept of ownership spheres within this context is complex, as it lacks a clear definition and often relies on subjective assessments from informed observers (Agnblad et al., 2002). Consequently, the concept of owner-spheres is not easily comparable internationally. Nonetheless, ownership spheres play a significant role in Nordic corporate governance, particularly in Sweden (Agnblad et al., 2002). The term “sphere” has been used by Swedish journalist Sven Ivan Sundqvist in his book *Owners and Power in Listed Swedish Companies,* where he defined the concept of owner-spheres as investors in control over three or more listed firms. Due to their long-term holding, it is likely that owner-spheres play an active role in the firm’s governance (Kjærland et al., 2020).

Two of the largest ownership spheres in Sweden are those of the Wallenberg family and the Handelsbanken sphere. Both spheres have their origins linked to a “house bank” (Agnblad et al., 2002) and are represented through their respective close-end investment funds: Investor AB for the Wallenberg family and Industrivärden AB for the Handelsbanken sphere. These investment vehicles facilitate management of their shareholdings. Moreover, these owner-spheres have networks of CEOs and board members across their portfolio companies, a phenomenon Collin (1993) refers to as the “brotherhood of the Swedish spheres”. These

networks of senior executives allow the owner-sphere to expand their influence beyond financial control vis-à-vis other shareholders (Collin, 1993).

In order to maintain the role as controlling shareholders, these owner-spheres have usually built up an information advantage over time, (Sjöstrand, 2023) making it difficult to replace them. This information asymmetry is crucial in understanding the dynamics at play, as it enables these groups to monitor management teams and make informed decisions. Given this advantage, it is interesting to examine how such owner-spheres might influence external reporting practices within their portfolio companies under IFRS 8 adopting the management approach. As seen in Fan & Wong (2002) and Yang (2010), the presence of a controlling shareholder has been shown to be negatively associated with earnings quality. It is conceivable that these owner-spheres might not see the same need for extensive external disclosures, as they already maintain close oversight through their network of executives, industry contacts and in some cases "house-bank" affiliation. This leads us to formulate the following directional hypothesis:

H2: There is a significant negative relationship between segment disclosure quantity/quality and presence of controlling shareholder.

4.3 Quality and Quantity from an External Users Perspective

Financial analysts serve as sophisticated users of accounting information (Healy et al., 1999; Ramnath et al., 2008). Furthermore, financial analysts actively engage with corporate management, participate in earnings calls, and analyse firms' financial statements, allowing them to contextualise the accounting information better. Based on the view that access to information is better, analysts are expected to make better earnings predictions for companies with greater segment reporting quantity and quality (André et al., 2016). This reasoning is based on the belief that increased disclosure of segment accounting items provides greater visibility into the firm's future revenue streams, cost structure and risk exposures, thereby reducing information asymmetry and improving forecast accuracy. Conversely, under poor segment quantity, analysts face greater uncertainty and information asymmetry, potentially leading to larger forecast errors. Given the analysts' knowledge about the firms they cover, analysts are also expected to better understand and distinguish between high- and low-quality segment disclosures (André et al., 2016). With a better understanding of the accuracy of the companies' segment aggregations, analysts are expected to achieve more accurate estimations from high-quality data compared to average- and low-quality data.

However, due to the relationship between the analysts and the firms they cover, there is a potential risk that important information used for estimating future earnings is obtained through private interactions with the management rather than through the annual and quarterly statements (Epstein & Palepu, 2007; Soltes, 2014). In this scenario, the segment reporting quantity and quality becomes less influential for the forecasting accuracy, as the output is more reliant upon other channels rather than the number of accounting items and/or segment

aggregations (André et al., 2016). It could also be the case that analysts' ability to interpret the segment reporting quality and quantity is not reflected in the data utilised in this study. Accordingly, we formulate our third hypothesis in a nondirectional way:

H3: There is a significant relationship between segment disclosure quantity/quality and analysts' earnings forecast accuracy.

5. Method

In the following section, we begin by introducing our research methodology, explaining the analysis we run to test our hypothesis and describing all the variables included in the different regressions, both dependent and independent. Thereafter the sample selection process is described followed by a summary of the descriptive statistics of the sample.

5.1 Research Design

5.1.1 Dependent Variables and Regressions on Determinants of Segment Reporting

In our first analysis, the dependent variables are segment disclosure quantity and quality. Although it could be argued that the two characteristics are sometimes intertwined, for example when segment reporting quantity is used to measure the segment reporting quality, we have adopted a similar approach as other studies where the two variables become disentangled (Botosan, 2004).

The segment reporting quantity (*SrQt*) variable is measured as the number of accounting items disclosed for each segment in the segment note of the annual report. By measuring *SrQt* in this way, our study aligns its methodology with prior research where segment reporting quantity has been measured similarly (Crawford et al., 2012; Nichols et al., 2012; Bugeja et al., 2015; André et al., 2016). When calculating the number of accounting items disclosed per segment, we manually counted the number of line items that were disclosed for all segments in the segment note. As an example: If a company reported three operating segments under the management approach and each segment disclosed accounting items such as: revenue, operating profit, profit of the year, segment current assets, segment non-current assets and segment liabilities, the *SrQt_Raw* equalled 6. The actual variable used in the regressions – *SrQt* - was then computed as the natural logarithm of 1 plus *SrQt_Raw*.

When measuring segment reporting quality (*SrQl*), we adopted a metric designed by André et al. (2016), which in turn was inspired by Ettredge et al. (2006). The original quality-metric, (Ettredge et al., 2006), builds on the idea that cross-segment profit variability can be an indicator of transparency of the company segment reporting. If management was improperly aggregating segments to smooth earnings, we would expect lower cross-segment variability (Ettredge et al., 2006; André et al., 2016). In line with André et al. (2016), we make two adjustments to the *SrQl* measure designed by Ettredge et al. (2006). First, rather than using

return on sales as the operating profit measurement we use return-on-assets (ROA). ROA is considered a more comprehensive return measure since it includes the asset base, instead of just looking at the profit margin. Secondly, we take industry-level profitability into account on a segment level when calculating Adjusted ROA. This is done by subtracting the segment ROA from the industry ROA, where the industry ROA is based on ROA of a single segment firm with the same industry classification as that segment. Lastly, we weigh the segment industry-adjusted ROA by its share of total assets. These adjustments are, as mentioned, aligned with prior research by André et al. (2016) and Lail et al. (2014) and are further specified in the formulas below. For reference, the *s* relates to the segments of the firm *i.*

$$ROA_{s,i} = \frac{Operating\ profit_{s,i}}{Assets_{s,i}}$$

$$AdjROA_{s,i} = \left(ROA_{s,i} - IndustryROA_s\right) * \frac{Assets_{s,i}}{TotalAssets_i}$$

$$SRQl_i = Log\left(2 + \max AdjROA_{s,i} - \min AdjROA_{s,i}\right)$$

To examine the potential determinants, we first run cross-sectional least-squares regressions with the *SrQt* and *SrQl* as dependent variables. The data was collected for year 2009, which was the first full fiscal year after IFRS 8 came into effect. The transition to IFRS 8 required management to re-evaluate their firms' segment reporting based on the new management approach and potentially implement changes to their existing disclosure practices making this a relevant year to examine. Prior research (Nichols et al., 2012; André et al., 2016; Kajüter & Neinhaus, 2017; Gisbert et al., 2024) has also focused on reviewing the effects of adopting IFRS 8 in the year of mandatory adoption. Below is **Model (1)** specification:

$$\begin{aligned} SrQt\ or\ SrQl = {} & \beta_0 + \beta_1 Herfindahl + \beta_2 R\&D + \beta_3 LnMgOwners + \beta_4 Owners\&Power + \beta_5 CV \\ & - ratio + \beta_6 ROA + \beta_7 Loss + \beta_8 M\&A + \beta_9 Big4 + \beta_{10} LengthAR + \beta_{11} ADR \\ & + \beta_{12} EqIssue + \beta_{13} BTM + \beta_{14} LnTA + IndustryFE + \varepsilon \end{aligned}$$

In the second part of our analysis, we examine potential explanations for why managers decide to deviate from the expected level of *SrQt* and *SrQl* and report higher but also lower levels of *SrQt* and *SrQl*. The sample is divided into quartiles based on *SrQt* and *SrQl*, with the quartiles for *SrQt* based on the number of accounting items disclosed in the segment note (*SrQt_Raw*) and the quartiles for *SrQl* based on the value of the *SrQl* variable. For the *SrQt* quartiles, companies are classified as *Under-disclosers*, *Box-tickers* and *Over-disclosers*, where *Box-tickers* makes up the two middle quartiles and is considered the expected reporting level for *SrQt*. In a similar way, the quartiles for *SrQl* forms the groups *LowQl*, *AvgQl* and *HighQl* where *AvgQl* makes up the two middle quartiles. To examine possible explanations for why the CODM deviate from the expected levels of *Box-tickers* and/or *AvgQl*, we run multinominal logistic regression **(Model (2))**. The multinominal logistic regression uses the middle quartiles, *Box-tickers* and *AvgQl*, as reference groups and compares the groups of *Under-* and *Over-disclosers* to *Box-ticker*, as well as *High-* and *LowQl* to *AvgQl*. Thus, the results of the

regressions informs us whether certain firm characteristics, proxied through our independent variables, increases or decreases the probability of a company deviating from the expected levels of *SrQt* and *SrQl*.

5.1.2 Explaining the Theoretical Links of the Independent Variables

When examining potential determinants of segment reporting quantity and quality, we have decided to look for proprietary cost and agency cost concerns in accordance with earlier research (Aleksanyan & Danbolt, 2015; André et al., 2016, Berger & Hann 2007; Gisbert et al., 2024; Leuz, 2004). In addition, our study investigates whether there is a link between segment reporting of Nordic companies and the unique Nordic corporate governance and ownership model. With the goal of examining to what extent the unique characteristics of the Nordic corporate landscape impact segment reporting, we have designed variables serving as proxies. In addition, we also include a set of control variables to test for more generic determinants.

5.1.3 Proprietary Cost Theory - Applied Operationalisation

To proxy the association between Proprietary cost theory and segment reporting quality and quantity, we use variables *Herfindahl* and *R&D*. The *Herfindahl* variable is used in prior research as well (Harris, 1998; Botosan & Stanford., 2005; Berger & Hann., 2007; André et al., 2016) and serves as a proxy for industry-, and product market-related proprietary cost. The variable measures the industry concentration level, which in turn is believed to affect managers' disclosure strategy as competition plays a role in how freely managers disclose commercially sensitive information. Aligned with prior literature (Depoers & Jeanjean, 2012), we calculate *Herfindahl* as the sum of the squared market share of all firms at a two-digit SIC code, where the market is delimited to the listed firms in the sample countries.

The second proxy for proprietary costs, *R&D*, is linked to the level of innovation within the company which is also believed to impact the build-up of proprietary costs concerns. As companies invest more in research, they develop improved products, services and patents which can yield an advantage against competitors. The higher the investment in *R&D*, the higher the innovation and hence the higher the proprietary cost is assumed (André et al., 2016). Like prior research (Ellis et al., 2012; André et al., 2016) *R&D* is measured as the natural logarithm of 1 plus research and development expenditures divided by lagged total sales, with the value of 0 if R&D expenditures are missing.

5.1.4 Agency Theory - Applied Operationalisation

The variable used as proxy for Type I agency cost is managerial ownership (*LnMgOwners*) which is inspired by prior research (Lennox, 2005; André et al., 2016). In order to compute the variable, the shares held by the management team were hand collected from the annual report and put in relation to the total shares outstanding. *LnMgOwners* is then calculated as the natural logarithm of the percentage of shares outstanding owned by management team. Despite the

rationale that management ownership would align managers and shareholders interest, it is believed that management ownership could lead to entrenchment if their ownership stake is large enough for the management to control the firm (Jensen & Meckling, 1976; Morck et al., 1988) When the management controls the firm, the management obtains considerable discretion in steering the affairs towards a certain direction and thus may divert from the shareholders' interests (Morck et al., 1988). If the firm were instead to be controlled by the owners, the owner-managers would have no incentives to allocate resources unfavourably as they would suffer directly from reduced share price (Morck et al., 1988). Since managers obtain discretionary mandate under the management approach, they may use this to reduce the segment reporting disclosure as it would limit shareholders' insights on their strategy execution.

5.1.5 Nordic Model – Applied Operationalisation

In order to test whether the distinct features of the Nordic context serve as determinants of segment reporting quality and quantity, we proxy the Nordic model through the variables *Owners&Power* and *CV-ratio.* The *Owners&Power* variable is a proxy for the unique ownership constellation where companies are controlled by owner-spheres, especially witnessed among Swedish firms (Collin, 1993; Agnblad et al., 2002; Fristedt & Sundqvist, 2009). As mentioned earlier, owner-spheres usually operate as controlling shareholders of their portfolio companies, with influence over the management team through a developed network of executives (Collin, 1993; Sjöstrand et al., 2016). By exercising influence over the management team, we believe it becomes possible for an influential owner to impact the company's financial reporting. Specifically, this relationship is particularly relevant for segment reporting under IFRS 8 and the management approach, where the CODM defines what to report externally. If you can control the CODM, you can effectively set the boundaries for what segment information is to be reported, both in terms of segment reporting quality and quantity.

The *Owners&Power* is a dummy-variable with the value 1 if the company is listed as a sphere-owned company in the book *Owners and Power in Sweden's Listed Companies* written by Fristedt and Sundqvist (2009). According to the authors, a sphere is established if an investor or family gains control over at least three publicly listed firms (Fristedt & Sundqvist, 2009). We consider the book to be a reliable source due to the authors' long-term research on ownership sphere dating back to 1985, and the fact that firms are invited to correct the information before publication. Additionally, we take comfort in prior research using similar methods for making distinct ownership classifications. For instance, Ali et al. (2007) defined family firms in the S&P 500 by looking at a list published in the Business Week Magazine.

The second variable used as a proxy is *CV-ratio* which measures the relationship between cash flow rights and voting rights held by the largest owner. Since sphere-owners usually take control over companies by acquiring shares with stronger voting rights (Agnblad et al., 2002; Cronqvist & Nilsson, 2003; Sjöstrand et al., 2016), sphere-owned companies should demonstrate higher dispersion between capital and voting ownership. The divergence in the

ratio therefore represents to what extent the firm is dominated by a controlling owner (Fan & Wong, 2002). The high degree of ownership concentration in Nordic firms, enabled by owner-spheres and shares with strong voting-power, may create a conflict of interest between majority and minority shareholders (La Porta et al., 1999; Ali et al., 2007;) with potentially unfavourable effect on disclosure.

5.1.6 Control Variables

In addition, our analysis includes multiple control variables, following the approach of André et al. (2016). To begin with, we include *ROA* and *Loss* to control for firm performance. *ROA* is measured as the return-on-assets on company-level and *Loss* is a dummy variable equal to 1 if the firm made a loss on net income level during the year. We also include the variable *M&A,* which is a dummy variable for whether the company engaged in any mergers and acquisitions during the year. This aims to control for whether the firm had enough resources to increase number of segments from acquisitions, but also if the firm had incentives to change reporting due to M&A activity. Moreover, with annual reports being an important source of information for external users, we proxy the quality of disclosed accounting information by including the *Big4* variable which equals 1 for companies with auditors from any of the big four firms (Pwc, Deloitte, KPMG, EY). The length of the annual report is captured by the *LengthAR* variable and is intended to proxy a firm's general level of disclosure quantity.

Furthermore, we also control for whether companies are cross-listed in the US through the *ADR* variable since it could have an impact on the firm's transparency due to greater capital market scrutiny and serving two disclosure standards (Coffee, 2002). Another factor affecting firms' financial reporting is whether they have engaged in capital market transactions recently which we capture through the *EqIssue* variable. In order to raise capital, firms usually have to share comprehensive information to attract investors and reduce information asymmetry (Lang & Lundholm, 2000). The *EqIssue* variable is calculated as the equity issued during the year divided by the market cap at the beginning of the year. We also include the book-to-market ratio to control for firm growth. Firm size is captured through the variable *LnTA* and is measured as the natural logarithm of the company's total assets. Lastly, we control for industry fixed effects at the one-digit SIC code to see whether companies in the same industry have similar segment disclosure quality and quantity (Botosan & Harris, 2000).

5.1.7 Testing the Segment Reporting Impact on Information Environment

As this paper is also aiming to examine whether the implementation of IFRS 8 and the management approach has impacted the information environment for the users of financial statement, we run the **Model (3)** tests:

$$FE_{i,t+1} = \beta_0 + \beta_1 Under - discloser_{i,t} + \beta_2 Over - discloser_{i,t} + \beta_3 Owners\&Power_{i,t} + \beta_4 CV - ratio_{i,t} + \sum Control\ variables + Industry\ FE + \delta_{i,t+1}$$

$$FE_{i,t+1} = \gamma_0 + \gamma_1 LowQl_{i,t} + \gamma_2 HighQl_{i,t} + \gamma_3 Owners\&Power_{i,t} + \gamma_4 CV - ratio_{i,t} + \sum Control\ variables + Industry\ FE + \theta_{it+1}$$

The dependent variable in these regressions is the forecasting error *FE,* calculated as the absolute value of the difference between the actual earnings-per-share and the last yearly estimated earnings-per-share, divided by the actual earnings-per-share (Horton et al., 2013; André et al., 2016). *FE* is used as a proxy to assess the impact of the management approach on the information environment for users and is considered a relevant proxy because earnings forecasts have a central role when financial analysts perform valuations and analysis (Schipper, 1991). Since the earnings estimate is only input and not the final product, it has an impact on the accuracy and quality of the final product such as the accuracy of the company valuation and analyst report.

Due to the central role of segment reporting when analysing and understanding companies (Brown, 1997; Epstein & Palepu, 1999; Nichols et al., 2013), better segment reporting is likely to improve earnings estimates, resulting in lower forecasting errors. The *FE* is calculated at analyst-firm level since individual analysts may interpret disclosure quality and quantity differently, making their unique assessment relevant. Besides the fact that analysts may be heterogeneous in their interpretation, varying efforts, experiences, and abilities will also impact the earnings forecast accuracy (André et al., 2016). Additionally, Kirk et al. (2014) provide evidence that investors use individual analysts' forecasts as a benchmark when analysing the reported earnings, making it relevant to look at the analyst-firm level. Going beyond consensus estimates also provides more observations which improves the quality of the statistical test.

The control variables employed in the model have proven to impact the analysts' forecast error in prior literature (Bradshaw et al., 2009; Lang & Lundholm, 1996; André et al., 2016; Tan et al., 2011). To begin with, we include the control variable *Segments,* which proxies the firm's complexity level and is calculated as the number of segments that the firm reports in the segment note. The variable assumes that firms with more segments are more complex as they operate a dispersed business model, with each segment representing a distinct business area. In turn, complex firms make it harder for analysts to forecast earnings (Dunn & Nathan, 2005). The variable *EQ* is included to proxy the earnings quality of the firm. The variable is based on the standard deviation of residuals from the Dechow & Dichev (2002) model of discretionary accruals, as it is claimed that analysts consider these when forecasting earnings (Givoly et al., 2011).

We also include the firm size variable *LnTA* because larger firms are believed to have better analyst and media coverage, impacting the information environment (Kothari et al., 2009). The variable *LnAnalysts* is included to test the firm's overall information environment linked to analyst coverage. Naturally, when companies are covered by a larger number of analysts, it becomes scrutinised to a greater extent which impacts the overall information environment. The variable is calculated as the number of analysts covering the company (André et al., 2016).

Previous empirical findings show that it is more uncertain to forecast loss-making firms, we also include the *Loss* variable (Das, 1998).

Moreover, firms involved in capital market transactions during the year are deemed more likely to disclose voluntary accounting information. Since this information is believed to improve the information environment (Lang & Lundholm, 2000), we control for *EqIssue* in this test as well. Aligned with prior research (Lang & Lundholm, 1996; André et al., 2016), we include the variable *ReturnVolatility* to proxy for firm-related news in the market. Similarly to the first test, we include *BTM* as a proxy for a firm's growth. In general, growth companies are believed to be more volatile and unpredictable in their performance, making it more difficult provide accurate earnings forecasting accuracy for these firms. The *ADR* is also included in order to proxy for a firm's exposure towards additional capital market scrutiny as well as another accounting regime. In this scenario, it is believed that both factors may improve the firm's information environment (Lang et al., 2003). Lastly, we include industry fixed effects at the one digit SIC-code to account for differences in forecasting difficulty at the industry level.

The regression for the forecasting error aims to compare the forecasting errors of firms deviating from the expected level of *SrQt* and *SrQl* to those who report in line with average expectations. Hence, we compare forecasting errors of *Under-* and *Over-disclosers* to *Box-tickers* as well as *LowQl* and *HighQl* to *AvgQl*. Therefore, it is important to grasp the meaning of the signs for these variables. In the first regression, if β_1 is positive compared to *Box-tickers* it implies that analysts' earnings forecasts for *Under-disclosures* are less accurate, meanwhile a negative β_2 implies that analysts utilise the extra information provided by *Over-disclosers* to make better forecasts. In a similar way, if analysts are able to grasp the segment reporting quality the γ_1 it should be positive meaning that forecast errors for *LowQl* are higher compared to the benchmark *AvgQl*. On the other hand, γ_2 is expected to be negative since it would mean that the forecasting error for *HighQl* companies is lower than for *AvgQl*.

5.2 Sample Selection Process

Since this paper aims to explore determinants of segment reporting quality and quantity in the Nordic context, the sample construction began with identifying all Nordic companies listed on the Nordic stock exchanges as of 31 December 2009. The initial sample was identified through the Swedish House of Finance database, *Finbas*, which provides data on all companies listed on the stock exchanges in the Nordic countries. The stock markets included in the *Finbas* database were Stockholm Stock Exchange, Spotlight Stock Market, Stockholm First North, Copenhagen Stock Exchange, Copenhagen First North, Helsinki Stock Exchange, Helsinki First North, Oslo Børs, Oslo Axess as well as Nordic Growth Market. We decided to focus on Nordic companies listed at the end of 2009 since this was the first full fiscal year after IFRS 8 came into effect. Prior research (Nichols et al., 2012; André et al., 2016; Kajüter & Neinhaus, 2017; Gisbert et al., 2024) has also focused on reviewing the effects of adopting IFRS 8 in the year of mandatory adoption.

All Listed Companies on the Nordic Stock Exchanges at 2009-12-31	**1,091**
Non-Nordic Domiciled	-65
Financial Institutions	-93
Non-IFRS Companies	-150
Main Segmentation is Geographical	-143
Single-segment Firms	-155
Insufficient Financial or Segment Data	-191
Total	**294**

Table above describes the sample screening process.

Out of the 1,091 listed Nordic companies identified in the *Finbas* database, we removed 65 companies because they were considered to be located outside the Nordic region in terms of both country of domicile and headquarters. Another 93 companies, such as banks and credit institutions, were excluded due to their differing operations, which is also in line with André et al. (2016). Additionally, 191 companies were removed since financial data was missing. After that, we were left with a sample of 742 companies, for which we manually had to hand-collect the remaining data. We excluded 150 companies due to not applying IFRS. Furthermore, 143 firms were excluded since they only reported necessary data at the geographical level. Finally, 155 single-segment firms were excluded. Following these removals, the final sample consisted of 294 Nordic companies. The sample used for analysing forecasting errors contains 1,878 analyst-level observations spread across 178 unique firms. The reduction in the number of firms to 178 is due to a lack of coverage in the I/B/E/S database.

Country	**Count**	**Percent**
Sweden	122	41%
Norway	69	23%
Finland	52	18%
Denmark	51	17%
Total	**294**	**100%**

Table above shows the distribution of the sample based on country.

Looking at the geographical distribution of the final sample, each country is fairly represented based on its proportion of the total number of listed companies in the Nordic region. Sweden serves as the largest sample country based on the number of companies, with 122 companies, representing 41% of the sample. This is deemed reasonable as Sweden has the largest stock market with more listed companies than any other Nordic country. Thereafter, Norway is the second largest (69 companies) with 23% of the sample, followed by Finland (52 companies) and Denmark (51 companies), representing 18% and 17% of the sample, respectively.

5.3 Descriptive Statistics

5.3.1 Summary Statistics

Table 1: Descriptive statistics for the variables included in the main analyses of segment reporting quality and quantity

Variable	N	Mean	StdDev	Min	P25	Median	P75	Max
SrQt_Raw	294	14.401	6.884	4.000	10.000	13.000	17.000	60.000
SrQt	294	2.572	0.431	1.386	2.303	2.565	2.833	4.094
SrQl	294	0.749	0.144	0.693	0.708	0.722	0.750	2.561
Herfindahl	294	0.247	0.155	0.060	0.116	0.243	0.326	0.766
R&D	294	0.029	0.115	0.000	0.000	0.000	0.012	1.117
MgOwnership (%)	294	5.782	14.549	0.000	0.016	0.147	1.614	86.961
LnMgOwners	294	0.803	1.225	0.000	0.016	0.137	0.961	4.477
Owners&Power	294	0.167	0.373	0.000	0.000	0.000	0.000	1.000
CV-ratio	294	0.879	0.248	0.130	0.890	1.000	1.000	1.564
ROA	294	0.011	0.067	-0.396	-0.012	0.020	0.043	0.186
Loss	294	0.367	0.483	0.000	0.000	0.000	1.000	1.000
M&A	294	0.429	0.496	0.000	0.000	0.000	1.000	1.000
Big4	294	0.915	0.279	0.000	1.000	1.000	1.000	1.000
LengthAR	294	4.381	0.408	2.833	4.127	4.413	4.644	5.576
ADR	294	0.027	0.163	0.000	0.000	0.000	0.000	1.000
EqIssue	294	0.093	0.306	0.000	0.000	0.000	0.001	2.670
BTM	294	1.002	0.830	0.105	0.469	0.788	1.214	6.204
LnTA	294	21.796	1.991	17.757	20.379	21.641	23.399	26.888

Table 1 shows summary statistics for the variables used for the main determinants analysis. See Appendix B for the definition of the variables. SrQt_Raw and MgOwnership (%) are the raw variables, (i.e. the non-log) of SrQt and LnMgOwners respectively. Included descriptive statistics are number of unique firm-observations ("N"), mean, standard deviation ("StdDev"), minimum value, first quartile ("P25), median, third quartile (P75) and maximum value ("Max").

Table 1 presents summary statistics for the data used to test determinants of segment reporting quality (*SrQl*) and quantity (*SrQt*). The average (median) firm reports 14 (13) segment line items. The number of line items (*SrQt_Raw*) ranges from a minimum of 4 to a maximum of 60. The average (median) segment reporting quality is 0.75 (0.72) which is also in line with previous research by André et al. (2016) who reported mean and median values of 0.83 and 0.74 respectively. We report a slightly broader range of *SrQl* values ranging from 0.69 to 2.56 whereas André et al. (2016) ranged between 0.69 to 1.82. The *Herfindahl* variable exhibits significant variability (Mean = 0.25, StdDev = 0.16) suggesting industries with different concentration levels are covered in the sample. Around half of firms do not report R&D with median (average) value being 0 (0.03). The average firm in our sample has management holding 5.80% of the shares but the measure is significantly impacted by a few outliers with management holding large positions (Max = 86.97%). For comparison the median management ownership is 0.15% and the 75th percentile is 1.61%.

Our *ROA* variable also exhibits significant variability, which may be indicative of the difference in firm performance during the volatile year of 2009, in the wake of the Global Financial Crisis. Around 37% of firms made a loss in the year. Around 42% of firms were involved in M&A during the year, and 92% of firms were audited by a big four firm (e.g.

KPMG, EY, PwC or Deloitte). The average annual report was around 80 pages. Around 3% of firms had ADRs and issued on average 0.93% new equity in relation to their lagged market capitalisation. The average *BTM* was 1.002 but with significant variability in the data (StdDev = 0.830). The average firm held 14bn SEK of assets. Our max *LnTA* of 26.89 is higher than the 25.87 reported in André et al. (2016), who investigate the largest companies in Europe. This can be explained by the fact that we use SEK as common denominator in our sample, meanwhile André et al. (2016) used EUR, resulting in an exchange rate effect when comparing absolute amounts. This should, however, have limited impact on the results, considering it is the range that is primarily interesting since it indicates we have variation in firm size. Here we note, our sample ranges from 17.76 to 26.89 whereas André et al. (2016) ranges between 20.12 and 25.87.

Table 2: Descriptive statistics for the variables included in the main analyses of forecast errors

Variable	N	Mean	StdDev	Min	P25	Median	P75	Max
SrQt_Raw	178	14.865	7.249	5.000	10.000	14.000	18.000	60.000
SrQt	178	2.600	0.440	1.609	2.303	2.639	2.890	4.094
SrQl	178	0.743	0.118	0.693	0.709	0.722	0.742	2.174
Owners&Power	178	0.219	0.415	0.000	0.000	0.000	0.000	1.000
CV-ratio	178	0.863	0.242	0.246	0.755	1.000	1.000	1.246
Segments	178	3.118	1.080	2.000	2.000	3.000	4.000	6.000
LnTA	178	22.453	1.927	18.129	20.914	22.353	23.989	26.888
Loss	178	0.320	0.468	0.000	0.000	0.000	1.000	1.000
AnalystFollowing	178	11.573	11.108	1.000	3.000	8.000	16.000	61.000
LnAnalyst	178	1.921	1.126	0.000	1.099	2.079	2.773	4.111
EqIssue	178	0.090	0.302	0.000	0.000	0.000	0.002	2.670
LengthAR	178	4.472	0.382	3.219	4.277	4.505	4.718	5.576
ReturnVolatility	178	0.182	0.096	0.063	0.113	0.129	0.222	0.418
ADR	178	0.045	0.208	0.000	0.000	0.000	0.000	1.000
EQ	178	0.150	0.088	0.028	0.083	0.116	0.208	0.367
FE	1,878	0.181	0.211	0.000	0.036	0.099	0.250	1.009

Table 2 shows summary statistics for the variables used to test segment disclosure choices relationship with forecast errors. The sample includes a total of 1,878 forecast estimates spread across 178 unique firms. The 178 firms are a subset of the 294 firms from Table 1 for which I/B/E/S estimates were identified. See Appendix B for the definition of the variables. SrQt_Raw and AnalystFollowing are the raw variables, (i.e. the non-log) of SrQt and LnAnalyst respectively. Included descriptive statistics are number of unique firm-observations ("N"), mean, standard deviation ("StdDev"), minimum value, first quartile ("P25), median, third quartile (P75) and maximum value ("Max").

Table 2 presents summary statistics for the data used to test segment reporting quality (*SrQl*) and quantity (*SrQt*) impact on analysts' earnings forecast abilities. The final sample consists of 1,878 individual forecast estimates spread across 178 firms. The 178 firms are a subset of the 294 firms in Table 1 for which we identified I/B/E/S earnings estimates. Expectedly, the corresponding summary statistics for the variables from Table 1 are broadly similar to those in Table 2. New variables of interest include *Segments, ReturnVolatility*, *EQ* and *FE*. The average firm reported 3 segments and was covered by 11 analysts. The average return volatility amounted to 18.2% on an annual basis. The average earnings accrual error was 0.15 and the median analyst earnings forecast error was 0.10%.

5.3.2 Distribution of Sample into Subgroups

Table 3 and 4 present how the sample was divided into quartiles based on segment reporting quality and quantity. *Box-tickers* represent the middle two quartiles for the segment reporting quantity, and *AvgQl* represent the middle two quartiles for segment reporting quality. We did not recalibrate the groupings for the subset of 178 firms (1,878 firm-analyst observations) used in the forecast error analysis, as they remained close to their intended quartiles. For transparency, the *Box-tickers* represent 86 (48%), *Over-disclosers* 51 (29%), *Under-disclosers* 41 (23%). For the quality groups *AvgQl* represent 93 *(52%*), *HighQl* represent 42 (24%) and *LowQl* represent 43 (24%).

Table 3: Distribution of sample into groups based on segment reporting quality and quantity

		SrQt			
		Over-disclosers	Box-tickers	Under-disclosers	**Total**
SrQl	HighQl	13	34	27	**74**
	AvgQl	40	74	32	**146**
	LowQl	21	38	15	**74**
	Total	**74**	**146**	**74**	**294**

Table 4: Distribution of sample into groups based on segment reporting quality and quantity, as percentage of total

		SrQt			
		Over-disclosers	Box-tickers	Under-disclosers	**Total**
SrQl	HighQl	4.42%	11.56%	9.18%	**25.17%**
	AvgQl	13.61%	25.17%	10.88%	**49.66%**
	LowQl	7.14%	12.93%	5.10%	**25.17%**
	Total	**25.17%**	**49.66%**	**25.17%**	**100%**

Table 3 and 4 show the distribution of sample firms into groups of segment reporting quantity (i.e. *Over-disclosers, Box-tickers* and *Under-disclosers*) and segment reporting quality (i.e. *HighQl, AvgQl* and *LowQl*).

5.3.3 Correlation Matrices

Table 5 presents the Pearson correlation matrix for variables in the segment reporting quality and quantity determinants analysis. The highest correlation coefficients are observed between *Loss* and *ROA* (-0.587***) and between *LnTA* (natural log of total assets) and *LengthAR* (length of annual report) at 0.617***. The negative association between the loss dummy and ROA is expected, as firms with losses typically have poor asset returns. Similarly, larger firms often have longer annual reports due to more complex operations and regulatory requirements. Other correlations are below 0.500. The strongest correlation for *SrQl* is with *LengthAR* (-0.088) and *LnTA* (-0.086), though neither is statistically significant. For *SrQt*, the highest correlation is with *LnTA* (0.360***) indicating that larger firms tend to disclose more segment line items. The dummy variable for sphere ownership (*Owners&Power*) is negatively correlated with segment reporting quality (-0.071) and positively correlated with segment reporting quantity (0.022); however, neither correlation is statistically significant. The *CV-ratio* variable is positively correlated with *SrQl* (0.054) and negatively correlated with *SrQt* (-0.015), though these are also not statistically significant. Additionally, the correlation between *Owners&Power* and *CV-ratio* is -0.297***, indicating that the controlling owner in companies

classified as sphere-owned tend to have a higher difference between capital held and votes held, which is in line with expectations and previous research (Cronqvist & Nilsson, 2003).

Table 6 shows the correlation matrix for forecasting error analysis. The highest correlations are between *LnAnalyst* and *LnTA* (0.658***), *LengthAR* and *LnTA* (0.651***), and *LengthAR* and *LnAnalyst* (0.607***). Other correlations are below 0.500. The strongest correlations for *SrQt* and *SrQl* are with *LnTA* at 0.218*** and -0.135*** respectively. Interestingly, larger firms are associated with higher segment reporting quantity but lower quality. For analyst earnings forecast error (*FE*), correlations with *SrQt* and *SrQl* are -0.014 and -0.002 respectively and are not significant. The strongest correlation for *FE* is with *EqIssue* at 0.280*** followed closely by *Loss* at 0.270***. The noted correlation between *FE* and these two control variables is as expected. Additionally, analysts' earnings forecast errors are significant and negatively associated with *Owners&Power* (-0.126***), suggesting better forecasts for sphere-owned firms. For *CV-ratio*, the correlation with FE is positive and significant (0.188***) indicating that forecast errors tend to increase among firms where the discrepancy between capital and votes held is less pronounced for the largest owner.

Table 5: Pearson correlation-matrix for variables used in determinants analyses

	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)
1) SrQl	1															
2) SrQt	-0.062	1														
3) Herfindahl	0.080	0.070	1													
4) R&D	0.040	-0.009	-0.038	1												
5) LnMgOwners	0.025	-0.098*	-0.045	-0.035	1											
6) ROA	-0.057	0.154***	-0.042	-0.325***	-0.012	1										
7) Loss	0.005	-0.154***	0.031	0.056	0.025	-0.587***	1									
8) M&A	0.042	0.058	-0.138**	-0.053	-0.134**	0.165***	-0.204***	1								
9) Big4	0.037	0.034	0.071	0.046	-0.220***	-0.021	0.005	0.116**	1							
10) LengthAR	-0.088	0.242***	0.017	-0.055	-0.201***	0.135**	-0.084	0.253***	0.168***	1						
11) ADR	-0.023	0.082	0.045	0.060	-0.103*	0.089	-0.041	0.109*	0.051	0.224***	1					
12) EqIssue	-0.033	0.041	-0.011	0.292***	-0.037	-0.294***	0.257***	-0.115**	0.062	0.037	-0.046	1				
13) BTM	-0.051	0.014	-0.022	0.082	-0.020	-0.305***	0.321***	-0.233***	-0.188***	-0.089	-0.093	0.182***	1			
14) LnTA	-0.086	0.360***	0.107*	-0.132**	-0.306***	0.345***	-0.253***	0.278***	0.194***	0.617***	0.322***	-0.082	-0.112*	1		
15) Owners&Power	-0.071	0.022	-0.075	-0.053	-0.158***	0.097***	-0.095	0.148**	0.071	0.145**	0.150***	0.024	-0.112*	0.243***	1	
16) CV-ratio	0.054	-0.015	-0.026	-0.017	0.009	-0.113*	0.114*	-0.045	-0.092	-0.122**	-0.147**	0.073	0.097*	-0.191***	-0.297***	1

Table 5 shows the Pearson correlation coefficients for the variables used for the main determinants analysis. See Appendix B for the definition of the variables. The sample contains 294 firm observations. Statistical significance is measured with a two-sided t-test; ***, **, * denote statistical significance at 1%, 5% and 10% respectively.

Table 6: Pearson correlation-matrix for variables used in forecast error analyses

	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)
1) SrQt	1													
2) SrQl	-0.058**	1												
3) Segments	0.143***	-0.080***	1											
4) LnTA	0.218***	-0.135***	0.450***	1										
5) Loss	-0.111***	-0.036	0.051**	-0.038*	1									
6) LnAnalyst	0.127***	-0.069***	0.261***	0.658***	-0.064***	1								
7) EqIssue	0.041*	-0.033	-0.056**	-0.169***	0.212***	-0.143***	1							
8) LengthAR	0.156***	-0.034	0.223***	0.651***	-0.074***	0.607***	-0.095***	1						
9) ReturnVolatility	0.041*	0.002	-0.197***	-0.408***	0.084***	-0.479***	0.141***	-0.324***	1					
10) ADR	0.077***	-0.032	0.190***	0.444***	-0.020	0.376***	-0.115***	0.252***	-0.075***	1				
11) Owners&Power	-0.127***	-0.097***	0.059***	0.216***	0.046**	0.177***	-0.029	0.137***	-0.258***	0.170***	1			
12) CV-ratio	0.033	0.034	-0.085***	-0.191***	0.147***	-0.161***	0.142***	-0.176***	0.182***	-0.261***	-0.452***	1		
13) EQ	0.060***	-0.024	-0.208***	-0.016	0.174***	-0.045**	0.028	0.053**	0.293***	0.126***	-0.153***	0.038*	1	
14) FE	-0.014	-0.002	-0.042*	-0.176***	0.270***	-0.225***	0.280***	-0.122***	0.231***	-0.152***	-0.126***	0.188***	0.086***	1

Table 6 shows the Pearson correlation coefficients for the variables used to test segment disclosure choices relationship with forecast errors. See Appendix B for the definition of the variables. The sample contains 1,878 observations. Statistical significance is measured with a two-sided t-test; ***, **, * denote statistical significance at 1%, 5% and 10% respectively.

6. Results and Analysis

In the following section, we present the results from our main analysis to test hypotheses *H1a*, *H1b*, *H2* and *H3*. Thereafter we present additional analyses examining the *Box-tickers* group more closely. Lastly, we discuss different robustness tests and statistical considerations for our regression models.

6.1 Main Analysis

6.1.1 Determinants of Segment Reporting Quantity and Quality

Table 7: Test of determinants of segment disclosure quantity (*SrQt*) and quality (*SrQl*)

	(1)			(2)		
	SrQt			SrQl		
	Coefficient	t	P>|t|	Coefficient	t	P>|t|
R&D	0.121	0.620	0.533	0.025	0.820	0.412
Herfindahl	-0.107	-0.550	0.584	0.009	0.600	0.550
LnMgOwners	0.005	0.240	0.809	-0.001	-0.630	0.527
Owners&Power	-0.065	-0.940	0.349	-0.003	-0.460	0.642
CV-ratio	0.075	0.730	0.465	-0.004	-0.350	0.724
ROA	0.376	0.890	0.374	0.008	0.120	0.905
BTM	0.037	1.370	0.171	-0.003	-0.890	0.373
Loss	-0.084	-1.240	0.217	0.008	1.390	0.167
LnTA	0.067	3.750	**0.000**	-0.006	-3.840	**0.000**
M&A	-0.044	-0.810	0.421	-0.002	-0.510	0.614
EqIssue	0.121	1.430	0.153	-0.009	-1.380	0.168
ADR	-0.022	-0.160	0.871	0.016	2.030	**0.043**
Big4	-0.046	-0.530	0.595	0.009	0.940	0.348
LengthAR	0.071	0.920	0.360	-0.001	-0.100	0.920
N		294			294	
F(22, 270)		3.820			2.360	
Prob > F		0.000			0.001	
R-squared		0.198			0.162	
Industry FE		YES			YES	

The table displays coefficients, t-values and p-values from OLS cross-sectional regressions, with *SrQt* as continuous dependent variable in model (1) and *SrQl* as continuous dependent variable in model (2). The models include industry fixed effects and cluster robust standard errors by firm. All variables are defined in the Appendix B.

Table 7 above presents the results from our first least squares regression model, where we regress segment reporting quantity (*SrQt*) and quality (*SrQl*) on a range of proxies for firm characteristics. Both models include industry fixed effects and adjust standard errors for heteroskedasticity. The overall explanatory power of the models is 20% and 16% for *SrQt* and *SrQl,* respectively, and is significant at the 1% level.

In neither model (1) nor (2) are the proxies for proprietary cost (*R&D, Herfindahl)* statistically significant. Examining the signs on the coefficients also shows a mixed result compared to expectations. The positive sign for both *SrQt* and *SrQl* for *R&D* is opposite to our hypothesis, as firms that spend more on research – a proxy for the build-up of proprietary information – would be associated with reporting more segment line items and better quality. The negative sign on *Herfindahl* and *SrQt* would be in line with our hypothesis, indicating that firms with a lower *Herfindahl* score (higher industry concentration) are associated with higher segment reporting quantity. The positive sign on *Herfindahl* and *SrQl* however, runs opposite to our hypothesis, indicating segment reporting quality increases in less competitive industries. Similarly, our proxy for Type I agency costs (*LnMgOwners*) is not significantly associated with segment reporting quality or quantity. Overall, we interpret these results as unsupportive of our hypothesis *H1a* and *H1b*. Compared with André et al. (2016), these results are consistent with the findings from their model specifications (1) and (2), which also do not find statistically significant associations between *SrQl* and *SrQt* and the proxies for proprietary and agency costs.

Turning to our first proxy for Nordic Governance model: *Owners&Power,* the coefficients for both *SrQt* and *SrQl* are in line with our hypothesis *H2*. However, the results are not statistically significant. The other proxy, *CV-ratio* is also not statistically significant and the coefficients show a mixed message. The coefficient on *CV-ratio* is positive for *SrQt* but negatively associated with *SrQl*. In contrast to prior research (Fan & Wong, 2002; Yang, 2010) we find no link between ownership concentration and disclosure informativeness. Overall, we find no support for our hypothesis *H2*.

The results from two of the control variables are worth noting. Firm size (*LnTA*) as proxied by the natural logarithm of total assets, is positively associated with *SrQt* (significant at 1%) and negatively associated with *SrQl* (significant at 1%). These results suggest that while larger companies disclose more segment line items, they reduce segment reporting quality. The result of increased disclosure in terms of segment line items for larger firms aligns with results in prior studies (Leuz, 2004; Nichols & Street, 2007). The other significant control variable is *ADR* which is statistically significant at 5% and positively associated with *SrQl.* This finding aligns with previous research, expecting higher reporting quality from firms voluntarily subjecting themselves to the disclosure standards and capital market scrutiny of the U.S. exchanges (Coffee, 2002).

6.1.2 Determinants of Deviations From Expected Levels of Segment Reporting Quantity

Table 8 presents the results from our second part of the analysis, where we conduct a multinomial logit regression to test possible determinants behind deviations from average levels of segment reporting quantity in the sample. The likelihood ratio is significant at 1% and the pseudo-R^2 is 14%. Related to the theoretical foundation, neither the proxies for proprietary (*R&D, Herfindahl*) or Type I agency costs (*LnMgOwners*) are significant. For this test as well, we find no support for hypotheses *H1a* and *H1b* claiming that certain agency and proprietary costs lead firms to report fewer items than suggested by the standard. This is contrary to André

et al. (2016), who find *Herfindahl* and *LnMgOwners* to be positive and significant for *Under-disclosers*. The authors interpret this result cautiously as suggesting that certain proprietary and agency costs lead firms to disclose fewer segment line items (André et al., 2016). Lastly, our two Nordic Governance model proxies (*Owners&Power, CV-ratio)* are also not statistically significant. We therefore find no conclusive support for our hypothesis *H2* in this test either.

Table 8: Multinomial logistical analysis for deviations from average *SrQt*

	(1)			(2)		
	Over-disclosers vs. Box-tickers			Under-disclosers vs. Box-tickers		
Variables	Coeff	Z	P>|Z|	Coeff	Z	P>|Z|
R&D	1.373	0.850	0.398	0.358	0.250	0.805
Herfindahl	-0.642	-0.500	0.618	0.358	0.280	0.781
LnMgOwners	-0.146	-0.920	0.358	-0.072	-0.540	0.586
Owners&Power	0.204	0.450	0.652	0.640	1.340	0.180
CV-ratio	0.993	1.370	0.170	0.070	0.100	0.917
ROA	3.446	0.860	0.390	0.649	0.220	0.822
BTM	0.178	0.850	0.397	-0.079	-0.350	0.728
Loss	-0.281	-0.620	0.535	0.880	2.140	**0.032**
LnTA	0.231	1.860	**0.063**	-0.247	-1.990	**0.047**
M&A	0.003	0.010	0.993	0.574	1.620	0.106
EqIssue	0.581	1.060	0.291	-0.986	-1.500	0.133
ADR	0.214	0.240	0.810	0.380	0.300	0.762
Big4	0.134	0.200	0.844	0.611	1.050	0.294
LengthAR	0.128	0.240	0.807	-0.511	-1.070	0.283
N	294					
Likelihood Ratio	87.98					
Prob > chi2	0.000					
Pseudo R2	0.1442					
Industry FE	YES					

The table displays coefficients, z-values and p-values from two multinomial logit regressions. In both model (1) and (2), the dependent variable is ordinal and based on whether the company belongs to one of three groups of *SrQt*. Firms in the top quartile of *SrQt* are labelled *Over-disclosers*, firms in the middle-two quartiles labelled *Box-tickers*, and firms in the lower quartile labelled *Under-disclosers*. The table above presents the results for a model predicting the likelihood that a firm is in either the *Over-disclosers* group (model 1), or in the *Under-discloser* group (model 2). The models include industry fixed effects. All variables are defined in the Appendix B.

In terms of control variables, firm size (*LnTA)* is statistically significant and positively associated with *Over-disclosers* (significant at 10% level), while negatively associated with *Under-disclosers* (significant at 5% level). These results further add to the findings in Table 7 suggesting that larger firms provide greater segment reporting quantity, with the inverse relationship for *Under-disclosers* suggesting that smaller firms are more likely to present fewer line items compared to *Box-tickers*. *Loss* is also statistically significant with a positive coefficient for *Under-disclosers* (significant at 5%), suggesting loss-making firms are more likely to belong to the bottom quartile of *SrQt*.

6.1.3 Determinants of Deviations From Expected Levels of Segment Reporting Quality

Table 9: Multinomial logistical analysis for deviations from average *SrQl*

	(1)			(2)		
	HighQl vs. AvgQl			LowQl vs. AvgQl		
Variables	Coeff	Z	P>|Z|	Coeff	Z	P>|Z|
R&D	-0.433	-0.310	0.759	-7.331	-1.400	0.160
Herfindahl	0.622	0.470	0.636	-0.837	-0.650	0.517
LnMgOwners	-0.112	-0.810	0.417	-0.077	-0.540	0.590
Owners&Power	-0.312	-0.600	0.551	0.436	0.942	0.942
CV-ratio	-0.406	-0.580	0.562	-0.826	-1.240	0.213
ROA	-0.821	-0.260	0.796	-2.739	-0.770	0.441
BTM	-0.013	-0.060	0.954	0.104	0.520	0.601
Loss	0.171	0.410	0.685	-0.283	-0.660	0.509
LnTA	-0.271	-2.100	**0.035**	0.161	1.330	0.182
M&A	-0.159	-0.430	0.666	-0.101	-0.280	0.777
EqIssue	-1.177	-1.740	**0.082**	-0.201	-0.330	0.740
ADR	0.136	0.110	0.911	-1.265	-1.070	0.283
Big4	1.126	1.660	**0.097**	-0.247	-0.440	0.659
LengthAR	-0.408	-0.820	0.410	-0.485	-0.990	0.321
N	294					
Likelihood Ratio	84.050					
Prob > chi2	0.000					
Pseudo R2	0.138					
Industry FE	YES					

The table displays coefficients, z-values and p-values from two multinomial logit regressions. In both model (1) and (2), the dependent variable is ordinal and based on whether the company belongs to one of three groups of *SrQl*. Firms in the top quartile of *SrQl* are labelled *HighQl*, firms in the middle-two quartiles labelled *AvgQl*, and firms in the lower quartile labelled *LowQl*. The table above presents the results for a model predicting the likelihood that a firm is in either the *HighQl* group (model 1), or in the *LowQl* group (model 2). The models include industry fixed effects. All variables are defined in the Appendix B.

Table 9 presents the results from multinomial regression to test possible determinants behind deviations from average levels of segment reporting quality. The likelihood ratio is significant at 1% and the pseudo-R^2 is 14%. Related to the theoretical foundation, neither the proxies for proprietary (*R&D, Herfindahl*) or Type I agency costs (*LnMgOwners*) are significant. In this test as well, we therefore find no support for the hypotheses *H1a* and *H1b* that certain agency and proprietary costs lead firms to report lower quality data. Lastly, our two Nordic Governance model proxies (*Owners&Power, CV-ratio)* are also not statistically significant. We therefore find no conclusive support for our hypothesis *H2* in this test either.

The control variable firm size is significant and negatively associated with high-quality segment reporting. This suggests that larger firms are more likely to provide lower quality segment data. Furthermore, accessing the capital markets during the year (*EqIssue*) is significant and negatively associated with *HighQl*. Therefore, the larger the share of new equity

raised, the less likely the company reports higher quality segment data. Lastly, the *Big4* variable is also statistically significant (significant at 10%) and positively associated with high-quality segment reporting.

6.1.4 Analysis of SrQt and SrQl Impact on Analysts' Earnings Forecast Accuracy

Table 10: Test of segment reporting quality and quantity for analysts' earnings forecast errors.

	(1)			(2)		
	FE			FE		
	Coefficient	t	P>|t|	Coefficient	t	P>|t|
Over-discloser	-0.036	-3.700	**0.000**			
Under-discloser	-0.040	-3.660	**0.000**			
HighQl				0.008	0.66	0.511
LowQl				0.053	4.680	**0.000**
Owners&Power	-0.012	-1.070	0.287	-0.018	-1.580	0.114
CV-ratio	0.039	2.340	**0.019**	0.040	2.440	**0.015**
Segments	-0.003	-0.720	0.470	0.001	0.310	0.760
LengthAR	0.015	0.950	0.343	0.039	2.240	**0.025**
Loss	0.093	7.100	**0.000**	0.094	7.260	**0.000**
EqIssue	0.123	4.410	**0.000**	0.135	4.780	**0.000**
ADR	-0.035	-2.910	**0.004**	-0.023	-1.880	**0.061**
LnTA	0.006	0.970	0.330	0.002	0.380	0.704
LnAnalysts	-0.037	-2.940	**0.003**	-0.043	-3.450	**0.001**
ReturnVolatility	0.331	3.020	**0.003**	0.311	2.760	**0.006**
EQ	0.133	1.810	**0.070**	0.124	1.660	**0.097**
N		1878			1878	
F(21, 1856)		16.160			14.780	
Prob > F		0.000			0.000	
R-squared		0.200			0.203	
Industry FE		YES			YES	

The table displays coefficients, t-values and p-values from OLS cross-sectional regressions, with *FE* as continuous dependent variable in both model (1) and (2). In model (1), firms in the top quartile of *SrQt* are labelled *Over-disclosers* , firms in the lower quartile labelled *Under-disclosers* , and firms in the middle-two quartiles labelled *Box-tickers* . In model (2), firms in the top quartile of *SrQl* are labelled *HighQl*, firms in the lower quartile labelled *LowQl*, and firms in the middle-two quartiles labelled *AvgQl*. The models include industry fixed effects and cluster robust standard errors by analyst. All variables are defined in the Appendix B.

The results in Table 10 indicate that, compared to *Box-tickers*, both *Over-* and *Under-disclosers* are significant and negatively associated with analysts' earnings forecast error (*FE*). These findings contrast with André et al. (2016), who reported higher forecast errors for both groups. Interpreting our results presents an unexpected finding: both *Over-disclosers* and *Under-disclosers* are associated with lower forecast errors. Reasonably, for *Over-disclosers*, providing more information would enhance the information environment for analysts helping them to make better forecasts. However, the lower forecast errors observed for *Under-disclosers* suggest that analysts might not gain much new information from incremental disclosures.

Related to this, Epstein and Palepu (1999) note in interviews with sell-side analysts that both private contact with the firms, and analyst meetings, rank above the financial reports in relevance to the analysts in their work. Sticking with this interpretation would lead us to question the extent to which the observed negative association between forecast errors and *Over-disclosers* is explained by segment reporting quantity or some outside endogenous variable.

In column 2, the empirical evidence suggests that companies with lower segment reporting quality (*LowQl*) have higher earnings forecast errors than companies in the benchmark group (significant at 1%). Conversely, for companies in the *HighQl* group, forecast errors do not statistically differ from the average error in the benchmark group *AvgQl*. This provides partial support for our hypothesis *H3*. Our results also complement the findings in André et al. (2016), who find a significant negative relationship between forecast errors and high-quality reporting. The combined results suggest that in certain environments, low quality reporting has been shown to increase forecast errors, and in other environments it has been shown that higher quality reporting is associated with lower forecast errors.

Turning to the impact of sphere-ownership on the information environment for analysts, the result is mixed based on *Owners&Power* and *CV-ratio*. The *CV-ratio* is statistically significant and positively associated with forecast errors (significant at 5%). This positive association between *CV-ratio* and *FE* would point to higher forecast errors for companies with more equal vote-to-capital ratios. Our second Nordic Governance proxy (*Owners&Power*) is not statistically significant.

Turning to the control variables that are statistically significant, the coefficients are as expected. *Loss* and *EqIssue* are both positively associated with analysts' forecast errors. Loss-making firms may face financial instability which leads to greater uncertainty about the future. In a similar vein, firms issuing equity may do so to address liquidity needs or fund new ventures, which both introduce more uncertainty to the outlook. Firms that are cross-listed in the US (ADR) seem to have lower forecast errors perhaps indicating a better information environment due to the increased disclosure requirements being on two exchanges. Moreover, Nordic companies cross-listed in the U.S are likely larger firms, presumably covered by more analysts and capital market scrutiny. Accordingly, we note that our variable for analyst following (*LnAnalysts)* is significant and negatively related to forecasting errors.

6.2 Additional Analysis

As part of our additional analysis, we run **Model (1)** and **Model (3)** again, focusing explicitly on the *Box-tickers* group. As managers prepare segment data, they decide on the quantity of segment line items to disclose and how to define the segments. Companies that choose to provide the line items suggested in the standard (*Box-tickers*) might nevertheless face agency and proprietary costs. By limiting the quality of the segment data, managers could theoretically still lower the overall informativeness of the segment disclosures while presenting the quantity

of segment line items in line with the average. Shifting expenses between segments to smooth the reported performance (Lail et al., 2014), is arguably a subtler method of reducing informativeness compared to changing the amount of segment line items between periods. Given that it is less visible, segment reporting quality may therefore be more susceptible to managerial discretion than the quantity of reporting (André et al., 2016). By focusing on the *Box-tickers*, who report a similar number of segment line items, we can analyse the determinants of quality within a more stable range, avoiding extremes of high and low quantity.

Table 11: Determinants of segment disclosure quality (*SrQl*) conditioned on the company being a *Box-ticker*

	SrQl		
	Coefficient	t	P>|t|
R&D	0.008	0.230	0.821
Herfindahl	0.004	0.170	0.862
LnMgOwners	-0.001	-0.300	0.767
Owners&Power	**-0.023**	-2.850	**0.005**
CV-ratio	-0.016	-1.020	0.311
ROA	0.049	0.420	0.677
BTM	-0.003	-0.580	0.562
Loss	0.002	0.220	0.830
LnTA	**-0.008**	-2.750	**0.007**
M&A	0.007	1.010	0.314
EqIssue	0.008	0.630	0.532
ADR	0.018	1.210	0.227
Big4	0.007	0.540	0.588
LengthAR	0.008	0.730	0.465
N		146	
F(22, 123)		1.61	
Prob > F		0.0445	
R-squared		0.1786	
Industry FE		YES	

The table displays coefficients, t-values and p-values from OLS cross-sectional regression, with *SrQl* as continuous dependent variable. The sample only includes the companies in the *Box-ticker* group of *SrQt* (146 companies). The model includes industry fixed effects and cluster robust standard errors by firm. All variables are defined in the Appendix B.

The results in Table 11 show a negative and statistically significant coefficient on *Owners&Power*, meaning that firms classified as sphere-owned and providing an average quantity of segment line items decrease the quality of their segment disclosures. Our firm size proxy *LnTA* is also negative and significant, indicating that larger firms report lower quality.

Table 12 shows the results from running the earnings forecast errors model on a sample of only *Box-tickers,* with the quality groups as independent variables of interest. Arguably this is a cleaner test of whether equity research analysts pick up differences in segment reporting quality when they are provided with a similar quantity of information. We find that *Box-Tickers&LowQl* is positive and significant, indicating that forecast errors are higher for the *LowQl* group compared to the *AvgQl* group. For the *HighQl* group we find no statistically

significant association compared to the *AvgQl,* suggesting analysts might not distinguish between average and high-quality data.

Additionally, we observe a negative and statistically significant coefficient for *Owners&Power*, indicating lower forecast errors for sphere-owned firms. One potential explanation for this may be that these firms are larger and more frequently covered by analysts hence are subject to greater regulatory and market scrutiny, which enhances the information environment for financial analysts. In Table 10, where the forecast error regression was run on the full sample, a negative and significant association between *LnAnalysts* and *FE* was noted. This suggests that higher analyst coverage is associated with lower forecast error, providing evidence that increased analyst scrutiny improves forecast accuracy.

Table 12: Analysts' earnings forecast error across groups of *High/Avg/LowQl*, conditioned on the company being a *Box-ticker*

	FE		
	Coefficient	t	P>|t|
Box-Tickers & HighQl	0.011	0.420	0.672
Box-Tickers & LowQl	0.055	2.430	**0.015**
Owners&Power	-0.067	-3.130	**0.002**
CV-ratio	-0.031	-0.980	0.326
Segments	0.015	1.430	0.154
LengthAR	0.031	0.870	0.384
Loss	0.158	7.160	**0.000**
EqIssue	0.269	6.910	**0.000**
ADR	-0.029	-0.980	0.325
LnTA	-0.006	-0.570	0.571
LnAnalysts	-0.020	-0.850	0.397
ReturnVolatility	0.983	4.820	**0.000**
EQ	0.516	3.130	**0.002**
N		876	
F(21, 854)		15.050	
Prob > F		0.000	
R-squared		0.289	
Industry FE		YES	

The table displays coefficients, t-values and p-values from OLS cross-sectional regressions, with *FE* as continuous dependent variable in both model. Firms in the top quartile of *SrQt* are labelled *Over-disclosers* , firms in the lower quartile labelled *Under-disclosers* , and firms in the middle-two quartiles labelled *Box-tickers* . Firms in the top quartile of *SrQl* are labelled *HighQl*, firms in the lower quartile labelled *LowQl*, and firms in the middle-two quartiles labelled *AvgQl*. Box-tickers & AvgQl is the benchmark group. The models include industry fixed effects and cluster robust standard errors by analyst. The sample contains only those companies classisfied as Box-tickers, adding up to a total of 876 unique firm-analyst observations across 85 companies. All variables are defined in the Appendix B.

6.3 Robustness Tests

To assess the potential multicollinearity among the independent variables in the regression, a Variance Inflation Factor (VIF) test was conducted. Multicollinearity refers to a situation where two or more explanatory variables in a regression model are highly linearly correlated, which can distort the estimation of coefficients and inflate standard errors, potentially leading to misleading inference (Wooldrigde, 2016). In our VIF-analysis, all variables have values below 10, which is considered a widely used rule of thumb among other research papers and statistics books (O'Brien, 2007). The highest VIF-factor was *LnTA* at 3.180. The mean VIF for the *SrQl/SrQt* determinants analysis was 1.486 and for the analyst earnings forecast model, it was

1.708. The full tabulated version of the VIF-analysis can be found in Appendix C. In addition to the VIF-analysis we also examine the correlation matrix for any signs on particularly strong correlations between the dependent variables and the independent variables and we note no correlations that stand out.

Heteroskedasticity refers to a violation of one of the key assumptions in the ordinary least squares (OLS) regression model, namely that the variance in the error terms is not constant across the independent variables. (Wooldridge, 2016). Running the Breusch-Pagan test on our initial model specifications we reject the null hypothesis of constant variance which we interpret as evidence of potential heteroskedasticity. To control for heteroskedasticity, we therefore employed heteroskedastic robust standard errors in our model to improve the reliability of inference, in line with what André et al. (2016) did too.

7. Conclusion

Following the implementation of the management approach, managers exercise varying degrees of discretion over two disclosure characteristics – segment reporting quantity and quality. This paper examined possible relationships between company characteristics and these two reporting dimensions – segment reporting quantity and quality. Furthermore, we examined the extent to which these segment disclosure choices impact analyst earnings forecast errors. The study focused on the Nordic region, a capital market setting characterised by concentrated ownership and strong power vested in controlling shareholders. The analysis was primarily conducted using OLS regressions and multinomial logistic regressions, on a sample of 294 Nordic listed firms as of the end of 2009.

Our initial results indicate that our proxies for proprietary and agency costs do not significantly influence managers' segment disclosure strategies, providing no support for hypotheses *H1a* and *H1b*. Furthermore, we found no evidence to support the hypothesis that high ownership concentration or the influence of owner-controlled spheres affects segment reporting, resulting in no support for hypothesis *H2*. Notably, we did find significant support for traditional determinants, such as firm size (Harris, 1998; Leuz, 2004; Nichols & Street, 2007). Additionally, we observed that smaller firms are more likely to offer less detailed segment reporting (*Under-disclosers*).

The second part of the analysis concentrated on segment disclosure choices and their relationship with analysts' earnings forecast errors. Our regression analysis revealed that companies with lower-quality segment reporting tend to have larger forecasting errors, complementing earlier findings by André et al. (2016). Contrary to André et al. (2016), however, we noted that both firms with above-average (*Over-disclosers)* and below-average (*Under-disclosers*) quantity disclosure were significantly negatively associated with forecast errors. This unexpected result challenges the conventional expectation that less information would lead to worse forecasting accuracy. It suggests that the relationship between disclosure and forecast errors may be more complex, underscoring the importance of considering analysts'

use of other information sources when assessing a firm's financial outlook. The significant relationship between segment reporting quality provides partial support for our hypothesis *H3*. Lastly, in our additional analysis on the *Box-tickers* subsample, we noted that sphere-owned firms were negatively associated with forecasting errors. This suggests that average segment reporting quantity for these sphere-owned firms does not necessarily harm the information environment, possibly due to the firm's size and greater analyst coverage.

By examining possible links between company characteristics and segment reporting choices in Nordic firms, we contribute to existing literature on IFRS 8 and the management approach in several ways. First, this study extends the empirical research to the Nordics, responding to earlier calls in the literature to address country and regional differences in the implementation of segment reporting standards (Nichols et al., 2013). Second, our study examines the impact of quantity and quality on the information environment, whereas most prior studies on IFRS 8 have focused on pre- and post-implementation comparisons that measure only the quantity dimension. Lastly, we explore the relationship between ownership structure and segment disclosure, along with how the influence of dominant shareholders shapes the information environment – an area that remains relatively unexplored in the segment reporting literature.

Moreover, our study has some limitations that are important to acknowledge. To begin with, although including all publicly listed Nordic firms in 2009 that have adopted IFRS 8, the number of observations used in the regression could be expanded. For instance, although focusing on the year of adoption is deemed rational and aligned with prior research applying the same methodology, 2009 was a turbulent year following the Global Financial Crisis. Furthermore, there are limitations concerning our definition of the segment reporting quality (*SrQl*) variable. Firstly, the profit measure used to calculate segment ROA cannot be guaranteed to be measured identically across firms, given that the standard allows non-IFRS measures. Both André et al. (2016) and Ettredge et al. (2006) discuss this issue. Furthermore, the underlying assumption of the segment reporting quality measure as defined in André et al. (2016), claims that higher segment variability corresponds to higher quality, which may not always be the case. Ideally, we would like to control for the deviation from a firm's "true" segment profitability, but this data is not publicly available.

We see several areas for future research on segment reporting. To begin with, future research could examine a different period or extend the study to a time series analysis spanning several years. Our study focuses on the first year of adoption of the new standard, and expanding the time frame could be an interesting avenue for new research. Another area for future research is to explore how the presence of non-listed competitors may impact the disclosure choice of managers in listed firms. We do not have a measure that looks into specific industry characteristics other than *Herfindahl*. If a listed company is legally obligated to disclose information that private competitors do not have to, it could enhance the incentives for listed firms to minimise the number of voluntary disclosures. Lastly, future research could examine how other types of ownership beyond sphere-owners influence segment reporting. This study would also be helpful for regulators as it provides information on how ownership dynamics potentially shape disclosure strategies.

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Appendix

Appendix A – Comparison Between IAS 14R, IFRS 8 and SFAS 131

	IAS 14R	*IFRS 8*		*SFAS 131*	
	Required	*Required*	*Required if included in profit/loss or provided to CODM*	*Required*	*Required if included in profit/loss or provided to CODM*
Primary/Operating Segments					
Revenue from external customers	✓		✓[a]		✓
Revenues from transactions with other operating segments	✓		✓[a]		✓
Profitability measure	✓	✓		✓	
Total assets	✓		✓	✓	
Total liabilities[b]	✓		✓		
Additions to non-current assets	✓		✓[a]		✓
Depreciation/amortization	✓		✓[a]		✓
Material non-cash items other than depreciation and amortization	✓		✓[a]		✓
Equity method income	✓		✓[a]		✓
Equity method investment	✓		✓[a]		✓
Interest revenue			✓[a]		✓
Interest expense			✓[a]		✓
Income tax expense/benefit			✓[a]		✓
Extraordinary items					✓
Geographic Disclosures Secondary (IAS 14R) or Entitywide (SFAS 131 and IFRS 8) Disclosures					
Revenue from external customers	✓	✓		✓	
Assets[c]	✓	✓		✓	
Additions to non-current assets	✓				

[a]Required if included in measure of segment profit/loss reviewed by chief operating decision maker (CODM), or included in measure of segment assets reviewed by CODM or otherwise regularly provided to CODM.
[b]Unlike SFAS 131, IFRS 8 requires disclosure of segment liabilities if those amounts are regularly provided to the CODM.
[c]Defined as total assets under IFRS 8 and long-lived assets under SFAS 131. Long-lived assets definition under SFAS 131 focuses on hard assets, thus appearing to exclude intangible assets, while IFRS 8 asset definition includes intangibles.

Credit: Nichols et al. (2013)

Appendix B - Variable Definition List

Disclosure variables	
Variable	**Definition and Data Source**
SrQt_Raw	The number of accounting items disclosed per segment in the segment reporting note to financial statements for the fiscal year 2009. Data is hand-collected from firms' financial statements.
SrQt	Natural logarithm of 1 plus *SRQt_Raw*.
Under-disclosers	If *SrQt_Raw* is in the 25th percentile.
Box-tickers	If *SrQt_Raw* is between the 25th and 75th percentiles.
Over-disclosers	If *SrQt_Raw* is above the 75th percentile.
SrQl	Natural logarithm of 2 plus the range of segment return-on-assets adjusted for mean industry return-on-assets, weighted by segment assets to total assets at the end of 2009. Financial data is hand collected from annual report and segment classification comes from Thomson Reuters Worldscope. We use ln(2 + x) to bring the distribution closer to the normal distribution following André et al. (2016). The variable is winsorized at 95% to mitigate the influence of extreme values.
LowQl	If *SrQl* is in the 25th percentile.
AvgQl	If *SrQl* is between the 25th and 75th percentiles.
HighQl	If *SrQl* is above the 75th percentile.
Other variables used in the models	
R&D	Natural logarithm of 1 plus research and development expenditures at the end of 2009, multiplied by one million to aid result exposition, and divided by lagged total sales, based on data from S&P Capital IQ. Where research and development expenditures are missing, the value is set to 0.
Herfindahl	Industry competition measure computed as the sum of squared market shares in 2009, based on data from S&P Capital IQ.
LnMgOwners	Following André et al. (2016), management ownership is computed as the natural logarithm of the percentage of ordinary shareholdings of current executive directors and set to 0 if managers do not hold shares in the company; computed based on hand-collected data from annual report of fiscal year 2009.
Owners&Power	1 if the company is included in an identified owner sphere in the book *Owners and Power in Sweden´s Listed Companies 2009* by Sven-Ivan Sundqvist.
CV-ratio	The ratio of capital ownership over votes ownership for the largest shareholder of the company.
ROA	Return-on-assets in 2009. Data comes from S&P Capital IQ.

BTM	Book-to-market ratio in 2009, based on data from S&P Capital IQ.
Loss	1 if net income before extraordinary items is below 0 and 0 otherwise, based on data from S&P Capital IQ.
LnTA	Natural logarithm of total assets for company i at the end of 2009, based on data from S&P Capital IQ.
M&A	1 if the company was involved in mergers or acquisitions during 2009 and 0 otherwise. Data comes from S&P Capital IQ.
EqIssue	Amount of equity issued in 2009 divided by beginning-of-year market capitalization, based on data from S&P Capital IQ.
ADR	1 if the company is also listed in the United States and 0 otherwise, based on data from S&P Capital IQ.
Big4	1 if company i is audited by a Big 4 auditor (Ernst&Young, Deloitte, KPMG, PriceWaterhouseCoopers) in 2009 and 0 otherwise, hancollected from annual report.
LengthAR	Natural logarithm of the number of pages in the company's 2009 annual report.
EQ	The negative of the absolute value of residuals from a Dechow Dichev (2002) model computed in-sample at the industry level. Data comes from S&P Capital IQ. Higher values mean higher earnings quality.
FE	Analyst-level earnings forecast error computed as the absolute value of the difference between the last yearly forecast estimate before the earnings announcement minus the actual earnings, deflated by absolute actual earnings. Data is for 2010 and comes from I/B/E/S. The variable is winsorized at 95% to mitigate the influence of extreme values.
LnAnalysts	Natural logarithm of the number of analysts covering the company in 2010, based on data from I/B/E/S.
ReturnVolatility	Standard deviation of daily stock return in 2009. Data comes from Thomson Reuters Datastream.
Segments	The number of segments reported in the segment note in the financial statements for the 2009 fiscal year. Data is hand-collected from the annual reports.

Appendix C - Results From Multicollinearity Analysis

Panel A: Results from VIF on *SrQt/SrQl* determinants OLS-regressions.

Variable	VIF	1/VIF
ROA	1.960	0.510
BTM	1.310	0.762
Loss	1.750	0.571
LnTA	2.490	0.402
R&D	1.320	0.756
M&A	1.330	0.752
EqIssue	1.250	0.801
ADR	1.180	0.847
Big4	1.170	0.852
Herfindahl	1.610	0.620
LengthAR	1.720	0.583
LnMgOwners	1.230	0.814
Owners&Power	1.270	0.790
CV-ratio	1.210	0.829
Mean VIF	**1.486**	

Panel B: Results from VIF analysis on analysts' earnings forecast error (*FE*) OLS-regressions.

Variable	VIF	1/VIF
Over-discloser	1.410	0.710
Under-discloser	1.290	0.777
HighQl	1.310	0.765
LowQl	1.430	0.697
Segments	1.450	0.689
LengthAR	1.830	0.545
Loss	1.240	0.809
EqIssue	1.140	0.875
ADR	1.550	0.646
LnTA	3.180	0.314
LnAnalysts	2.810	0.356
ReturnVolatility	1.680	0.595
EQ	1.880	0.531
Owners&Power	1.830	0.546
CV-ratio	1.590	0.631
Mean VIF	**1.708**	

Appendix D – Usage of AI in Thesis Writing

Coding process

As part of writing the STATA code for our analysis, we occasionally employed ChatGPT to search for help and interpret error messages. The STATA code generated by ChatGPT was checked against other internet sources and the Stata Guide by David Veenman. Thereafter, the code was tested again to ensure that it yielded the same results. No data was collected or analysed using AI tools, furthermore, the most important data points in our study were all hand-collected from archival annual reports.

Grammar and style checks

Regarding the actual writing, we have used Grammarly which has allowed us to access a more extensive spell-checking software compared to the default program in Microsoft Word. Grammarly is an AI assistant that provides suggestions for improving writing by helping with spelling, improving sentence structure, and overall readability. This has enabled us to save time and ensure a higher quality of the writing itself, in turn, enabling us to focus on producing relevant content. However, the suggestions provided by Grammarly to improve the linguistic quality were always manually evaluated and not always adopted when we did not consider the suggestions to be an improvement. The human evaluation therefore allowed us to ensure that no text changed in terms of meaning or interpretation. Thus, Grammarly has helped us with editing formulations and spelling, not in producing any of the content.

In summary, when looking back on this research process we do not believe that the usage of AI tools like ChatGPT and Grammarly have had any direct impact on the academical contribution of this Master thesis.