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Mandatory Financial Reporting Quality and Voluntary Disclosure: Evidence from change from SFAS 14 to SFAS 131

MSc. "Accounting, Auditing and Control"
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Abstract

This study examines the interaction between mandatory reporting and voluntary disclosure. It uses as a setting the adoption of SFAS 131, which is regarded by academics and regulators to have improved mandatory reporting after replacing the controversial SFAS 14 standard. The study investigates whether the adoption of SFAS 131 affects the likelihood of providing forward looking information for all of the companies' segments in order to discover if improved reporting quality affects companies' voluntary disclosure.

The methodology employed in this study is quantitative analysis through logistic regression. The main independent variable is *SFAS 131* - a dummy variable taking the value of 0 for the 1997 fiscal year end (before SFAS 131) and 1 for the 1998 fiscal year end (after SFAS 131). The dependent variable is segment level guidance *SLG*, a dummy variable, manually collected from 10-Ks of 167 different large U.S. companies for a period of two years. Control variables are added as well, two if which are found to be significant.

The results show no association between the improved reporting under SFAS 131 and companies' segment level guidance. A reason for this can be that segment level guidance is proprietary sensitive information, which is further supported by the fact that this study found proprietary costs to be negatively related to the likelihood of providing segment level guidance. The study also discovered that companies in the oil and gas and mining industries are more likely to issue such guidance.

Keywords: voluntary disclosure; mandatory reporting quality; segment reporting; segment level guidance; SFAS 131; proprietary costs

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List of Abbreviations and Acronyms

8-K	Current reports, submitted to the SEC, which discuss events or changes that are expected to be significant for investors
10-K	Filings, required to be annually submitted by public companies to the SEC
10-Q	Filings, required to be quarterly submitted by public companies to the SEC
BRM	Binary Regression Model
CODM	Chief Operating Decision Maker
EDGAR	Electronic Data Gathering, Analysis, and Retrieval system (A database, which contains companies' mandatory forms, which are filed to the SEC.)
FAF	Financial Accounting Foundation
FASB	Financial Accounting Standards Board
IFRS	International Financial Reporting Standards
IR Society	Investor Relations Society
MD&A	Management Discussion and Analysis – a part of the companies' financial statements
OLS	Ordinary Least Squares
PAT	Positive Accounting theory
ROE	Return on Equity
SE	Standard Error
SEC	Securities and Exchange Commission (an agency in the United States)
SFAS	Statement of Financial Accounting Standards
SLG	Segment Level Guidance
SD	Standard Deviation
VIF	Variance Inflation Factor

1. Introduction

1.1 Introduction

The communication between companies and their stakeholders is of crucial importance for the functioning of financial markets (Healy and Palepu 2001). If a firm reveals no information, it would be impossible for investors and analysts to measure its performance and forecast its future and for investors to decide in which companies to allocate their capital. As Arthur Levitt, the SEC chairman from 1993 to 2001, stated: “I firmly believe that the success of capital markets is directly dependent on the quality of the accounting and disclosure system. Disclosure systems that are founded on high quality standards give investors confidence in the credibility of financial reporting - and without investor confidence, markets cannot thrive.” (Levitt, 1998, p.80).

There are two ways of communication between a firm and its investors and the general public - through mandatory and voluntary disclosure. Mandatory reporting is required by regulatory bodies as a compulsory minimum, while voluntary disclosure is everything companies disclose on top of what is required. Mandatory and voluntary disclosure can be regarded as substitutes, with firms voluntarily disclosing more in order to fill the gaps of mandatory reporting (Healy and Palepu, 2001; Yu, 2011), or as complements (Einhorn, 2005; Yang, 2012). Studying their relation can help standard setters develop standards that influence both mandatory and voluntary disclosure of companies. Their relation can also shed light on effects of the information environment on changes to accounting standards - while mandatorily required items can decrease, voluntarily disclosed information can increase, thus the two types of disclosure can compensate for each other and should be observed together (Beyer et al., 2010). Still, little research has been conducted on their relation.

1.2 Background to SFAS 131

An unresolved issue is, however, the measurement of disclosure. Still, prior literature regarded the adoption of particular accounting standards or changes to them as an improvement to the quality of disclosure. It is asserted that the transition from Statement of Financial Accounting Standards (SFAS) 14 “Financial Reporting for Segments of a Business Enterprise” to SFAS 131 “Disclosures

about segments of an enterprise and related information" improved segment reporting. SFAS 14 and SFAS 131 are standards, which regulate the companies' disclosure in annual financial statements of the information, related to the segments they operate in. They regulate the disaggregation of different segments - whether different segments should be aggregated or provided separately, which is crucial for the quality of segment disclosure as it facilitates understanding of the segments the company operates in, given they have different performance and bear different risks. Evaluating the segments in which the company operates could help investors better evaluate the company's different activities and growth potential (Post-Implementation Review Report on FASB Statement No. 131, 2012). It helps them judge the overall state of the company, its risks and future. SFAS 14 and SFAS 131 also regulate how many line items to be provided per segment. This quantity of segment disclosure is vital for the understanding of segment performance and future outlook of the segment and of the company as a whole.

SFAS 131, "Disclosures about segments of an enterprise and related information" was issued by the Financial Accounting Standards Board (FASB) in June 1997, and became in force for the fiscal years after December 15, 1997. It regulates segment reporting of public business enterprises - those companies which have issued debt or equity securities, which are publicly traded. It takes the place of FASB Statement No. 14, "Financial Reporting for Segments of a Business Enterprise". It was adopted as a response to a criticism that under the old standard companies were exploiting the loose definition of an industry segment and were aggregating dissimilar segments, which resulted in reporting too few segments. SFAS 131 made changes to the definition of a segment that is to be reported. This is perhaps the major change it made. The new standard adopted the "management approach" to segment disclosure. It changed the segments to be reported from *industry segments*, defined by SEC as "a component of an enterprise engaged in providing a product or service or a group of related products and services primarily to unaffiliated customers [...] for a profit" (Statement of Financial Accounting Standards No. 14 § 10, 1976, p. 7) to *operating segments,* which are ones for which management collects information in order to assess firm performance. SFAS 131 formally defines an operating segment as "a component of an enterprise that engages in business activities from which it may earn revenues and incur expenses […], whose operating results are regularly reviewed by the enterprise's chief operating decision maker to make decisions about resources to be allocated to the segment and assess its performance, and for which discrete financial information is available" (Statement of Financial Accounting

Standards No. 131 § 10, 1997, p.7). Furthermore, the standard required more items per segment - it additionally required income tax and interest expense, interest revenue, and significant noncash items. More information about the required items under SFAS 131 can be found in Appendix H. The standard additionally required other disclosures, for example segment reporting in the interim financial statements.

1.3 Research question and goals

This study investigates the interaction between mandatory financial reporting and voluntary disclosure by employing the change from Statement of Financial Accounting Standards (SFAS) 14 to SFAS 131 as an exogenous change to mandatory reporting quality. It aims to empirically investigate whether the improved mandatory reporting standards, proxied by the change to the new SFAS 131, has an effect on the quantity of voluntarily disclosed segments information.

> RQ: Does the improved quality of mandatory segment reporting affect voluntary segment disclosure?

The goal of this paper is to explore the relation between mandatory reporting quality and voluntary disclosure. In order to fulfill this aim, it focuses on changes in specific standards – in this case segment reporting US GAAP standards and looks at the voluntary disclosure of issues related to that standard – in this case segment disclosure in the annual report. The paper uses the reporting on segments in the setting of the change of a highly criticized US GAAP standard on segment reporting - SFAS 14 to the assumed to be of higher quality standard - SFAS 131. SFAS 131 is regarded as an improvement to mandatory reporting quality as it leads to an increase in the disaggregation of segments and the line items per segment. This assumption of higher reporting quality is made following the approach of Leung and Verriest (2015) and Prencipe (2004) and views at segment reporting quality from the perspective of an investor. As “quality” of segment reporting this papers assumes (1) the quality of disaggregation in segments and (2) number of line items per segment, which reflect a higher degree of information that an investor receives (Leung and Verriest, 2015). The authors argue that investors are more able to evaluate firms, when they “provide financial statements for more segments and provide more financial items per segment” (Leung & Verriest, 2015, p.274). The disaggregation of data is of major importance to the users

of financial statements (Berger and Hann, 2003). Thus, providing disaggregated segments will be of value to investors.

Answering the research question requires measurement of voluntary disclosure quality (Beyer et al., 2010). Following the approach of Leung and Verriest (2015) to view at segment reporting quality from the perspective of an investor, the paper uses the method of Moldovan (2015) to regard whether companies provide guidance on the segment level as quantity and "quality" of voluntary disclosure. To answer the research question, the following sub-questions are prepared:

1) Theoretically, how could mandatory (segment) reporting affect voluntary (segment) disclosure? What accounting theories help explain the types of disclosure and their interaction?

2) How can mandatory (segment) reporting quality be measured? What is the purpose of SFAS 131 and how does it help to measure mandatory reporting quality? Does it improve segment reporting quality?

3) How can voluntary (segment) disclosure be measured?

4) How was the link between mandatory and voluntary disclosure researched?

5) As (segment) reporting quality increases after SFAS 131, do companies increase or decrease their (segment) voluntary disclosure?

1.4 Motivation and contribution

What motivates this research question is that the interaction between mandatory reporting and voluntary disclosure is underexploited in academic literature and the topic is relevant to standard setters. The answer to the research question could be of value to standard setters, because they have emphasised the importance of voluntary information, provided by firms, to the information environment and transparency, which are crucial to the functioning of financial markets. If an increase of voluntary disclosure is found, this would provide evidence for mandatory reporting and voluntary disclosure being complements as suggested by Einhorn (2005) and would emphasize the importance of high quality reporting standards to increased disclosure. This would also show that voluntary reporting does not remove the need for quality mandatory standards. On the other hand, if a decrease of voluntary disclosure is found, this would be an evidence for a substitute effect between the two types of disclosure. Alternatively, if voluntary disclosure decreases, this

can reflect an increase in the costs of disclosure, for instance proprietary costs, related to revealing information that can be of benefit to competitors.

This study could contribute to the existing literature by extending the scarce literature on the interaction between mandatory and voluntary reporting. Prior research in this area has suggested that such links exist – Einhorn (2005), however that link has not been sufficiently researched (Graham et al. 2005) and empirical evidence is limited especially as different changes to mandatory standards can yield changes in disclosure in opposite directions. That is a major reason why the study focuses empirically on change of one standard to disclosure related to it. The lack of literature on this subject is partly due to the difficulty and time intensiveness of measuring voluntary disclosure, often requiring hand collected samples.

Taking into account how mandatory standards affect voluntary disclosure, when researching voluntary disclosure, provides for its more realistic analysis, because much of what companies disclose is regulated by GAAPs (Scott, 2012). In addition, it is important to test this link empirically, because if it is found to exist, it should be taken into account in research on the economic effects of mandatory reporting standards to other constructs, due to the relation between voluntary disclosure and the construct, in which case voluntary disclosure is a correlated variable (Gigler & Hemmer, 2001). For instance, research often attributes effects or lack of effects of changes on mandatory disclosures to capital market conditions such as cost of capital or liquidity, ignoring the effects of the mandatory changes to other disclosure practices, such as voluntary disclosure, which can also exercise effect (Yu, 2011).

The change to the new standard provides the setting of a natural experiment. That way of research design was chosen in order to improve the internal validity of the study through observing an exogenous shock to mandatory reporting, which could limit endogeneity issues - firms do not choose themselves whether to report under the new standard, and the change happens before the hypothesized effect, thus limiting reverse causality issues.

Often literature has observed the link between adoption of IFRS as a whole and voluntary disclosure. This study instead contributes to the debate by examining how a particular change of a standard affects the voluntary disclosure of the affected by the standard items using the setting of SFAS 14 to SFAS 131 change. It is also interesting to observe whether the agency costs can hinder an increase in voluntary disclosure, which could be a topic for further research. Furthermore, this

study can contribute to existing literature on voluntary disclosure by suggesting a proxy for voluntary segment disclosure.

1.5 Research method

This paper studies large US companies, listed on 1997 Fortune 500 listing, an annual list of 500 the biggest by revenue U.S. companies. The sample size (after outliers' removal) consists of a total of 334 10-K annual reports of 167 different companies. The sample period is 2 years - the year before the adoption of SFAS 131 - 1997 fiscal year end and the year after its adoption - 1998 fiscal year end. To measure voluntary segment disclosure, the study uses whether companies provide guidance on the segment level. To measure mandatory reporting quality this paper assumes the adoption of SFAS 131 as an exogenous improvement to mandatory reporting quality.

To investigate whether there is an increase in voluntary disclosure due to the increase in the quality of mandatory reporting, the study uses multiple logistic regression analysis. The dependent variable is voluntary disclosure, proxied by a dummy variable *SLG* (Segment Level Guidance) which takes the value of 1 if he company provides forward looking information or guidance on the segment level and 0 if it does not. The main explanatory variable is mandatory reporting quality, proxied by a dummy variable *SFAS 131* (0,1) depending on whether the observation is under the old SFAS 14 standard or the new, of higher quality, SFAS 131,

The fact that SFAS 131 is *exogenous* and mandatory for all firms will limit endogeneity issues, as the values of the dependent dummy variable *SFAS 131* will not be determined by values of the independent variable - voluntary segment disclosure. That is, whether the companies adopt SFAS 131 will be externally imposed by the regulator, so it does not depend on the level of voluntary segment disclosure. This can solve the self-selection problems which often occur when voluntary disclosure is researched (Leuz & Wysocki, 2016). Chapter 5 "Research design" provides a detailed description of the research method employed and sample formation.

1.6 Results

Even though the number of companies that provide segment level guidance under SFAS 131 is higher than that number under SFAS 14, the study finds no significant association between the improved segment reporting after the adoption of SFAS 131 and voluntary segment disclosure. Two of the control variables are found to be significant at 5% level - oil, gas and mining industry

and proprietary costs. As expected, oil, gas and mining industry increase the odds of providing segment level guidance, while proprietary costs, consistent with Leuz (2003), decrease them. The results, which are relatively consistent with expectations, support the proxy for voluntary segment disclosure - segment level guidance, which is based on Moldovan (2015), as a reliable one.

1.7 Structure of the paper

The remainder of this paper is organized as follows. Chapter 2 explains the relevant to the research question accounting theories. Chapter 3 reviews related literature on mandatory and voluntary disclosure and their interaction, the proxy for increase of mandatory disclosure quality - SFAS 131 and measurement of disclosure. Based on the related research, Chapter 4 develops the hypotheses. It also discusses the validity of the research. Chapter 5 presents the research method used and sample formation and size, together with various statistical tests. Chapter 6 presents and discusses the results. Chapter 7 summarizes and concludes, and identifies limitations of the study and opportunities for further research on this topic

2. Theoretical background

The second chapter defines the different types of disclosure, and discusses relevant to the research question concepts and theories in accounting and business. These theories help explain why and when a company provides voluntary disclosure, and the reasons why one could expect a link between mandatory and voluntary disclosure in order to better understand that relation. It serves as a framework for the entire paper and shows the relevance of the study to the accounting literature.

The theoretical background consists of seven sections. The first section defines and discusses mandatory disclosure and voluntary disclosure. Each next section discusses theories, related to the disclosure of companies.

2.1 Theoretical background

2.1.1 Types of disclosure

There are two types of information that a company can provide to outside stakeholders, either quantitative, financial or non-financial. The first type of disclosure is mandatory disclosures - those that a firm is obliged to disclose in its financial statements by regulators and is verified by auditors. Issuers provide mandatory disclosure of financial information as part of mandatory filings for periodic reports. Examples of this are 10-K filings, which public companies are required to submit annually to the U.S. Securities and Exchange Commission (SEC). Those filings are more detailed than the annual report to shareholders, provide a comprehensive yearly analysis of the company and its performance, and contain the audited financial statements. Other examples are 10-Q report, which is filed each quarter and its contents are similar to the 10-K, but less detailed, however, it contains unaudited quarterly financial statements; 8-K current reports, which discuss events or changes that are expected to be significant for investors.

The second type of disclosure is voluntary disclosure - revealing of information in addition to the required disclosure by regulators, that managers choose to disclose for various reasons - to avoid litigation, but mainly to build credibility with market participants, which in terms is beneficial for the company for example in reducing the cost of capital due to the decrease in information asymmetry and for liquidity. Voluntary disclosure also reduces the agency conflicts between managers and owners (Healy & Palepu, 2001). However, such disclosure may come at a

cost - proprietary or agency costs, and the amount of disclosure is expected to be dependent on the cost-benefit analysis - e.g. firms would voluntarily disclose information only as long as the benefits of doing so outweigh the costs (Morris, 1987). Voluntary disclosure comes in various forms such as "management forecasts, analysts' presentations and conference calls, press releases, internet sites, and other corporate reports" (Healy & Palepu, 2001, p. 406). Many researchers state that the annual reports are one the most influential source of voluntary disclosure, given their popularity with analysts and investors (Lang et al, 1993).

2.1.2 Disclosure theory and disclosure incentives

Because managers are motivated to increase company value and company value depends on the amount of disclosure, they choose to disclose the amount of information that maximizes company value. Managers' motives to increase share price are explained by reputation concerns and contracts (Scott, 2012). Managers are motivated by reputation to increase company value, because if share prices do not perform according with market expectations, managers can be replaced, which can weaken their further career prospects. What's more, they are similarly motivated by contracts that depend on the company value and thus on the share price. For instance, they are often granted stocks of the company and stock options. That is why keeping the share price increasing is of importance to the manager. Share price depends on the amount and quality of company disclosure as it affects information asymmetry and the cost of capital. Because of the incentives of managers to increase company value, whether they disclose inside information or not depends largely on the marginal costs and benefits of disclosure to the company value. Benefits of disclosure include increased liquidity, lower cost of capital, and increased number of analysts following the company (Healy & Palepu, 2001). Increased liquidity is due to the increased investors' confidence in value of the company (Leuz and Verrecchia, 2000). Lower cost of capital is due to a decrease of information risk for investors and is empirically tested by Botosan (1997) and other researchers. Increased number of analysts following the company is due to being less costly for analysts to obtain information when companies disclose it voluntarily (Lang & Lundholm, 1996). Possible costs of disclosure include proprietary costs, due to competition accessing that information and using it to their advantage, and costs for the collection and construction of the information to be disclosed.

According to theory, even in the absence of regulation, companies can disclose information (Healy & Palepu, 2001; Scott, 2012). Contracts between principals and agents can require managers to disclose all information principals need. However, often principals are large group and need different amounts and types of information. In addition, even though reputation motivates managers to disclose, this does not always happen due to the costs of the disclosure. For those reasons, the existence of mandatory reporting standards can be justified as a way to increase overall disclosure quality, though their enforcement also comes at a cost such as increased bureaucracy costs and decreased signaling ability of companies.

2.1.3 Positive Accounting Theory

Positive Accounting theory (PAT) tries to explain the real world consequences of accounting. It was first developed by Watts and Zimmerman (1978). Contrary to normative accounting theory, it does not prescribe what accounting practices *should* be. Instead, it observes whether accounting information is actually useful, tries to predict how managers will react to changes in accounting standards, what their choice of accounting application is and what will be in different circumstances (Kabir, 2010). It regards managers as rational individuals, who are value maximizing - weighing the costs and benefits of their actions (Scott, 2012). The first empirical positive accounting article is Ball and Brown (1968), in which it the authors hypothesize and find evidence that accounting information is useful and has an influence on capital markets.

Positive Accounting theory can be used to predict managers' reporting decisions, influenced by contracting and political motives (Healy & Palepu, 2001). Such decision is for instance whether to disaggregate reporting segments or not. The theory "focuses on management's motives for making accounting choices when markets are semi-strong form efficient, there are significant costs in writing and enforcing contracts, and there are political costs arising out of the regulatory process" (Healy & Palepu, 2001, p. 419).

The three hypotheses of Positive Accounting theory are bonus plan hypothesis, debt covenant hypothesis and political cost hypothesis (Watts & Zimmerman, 1990). Under the bonus plan hypothesis, managers have incentives to report higher earnings for the period in order to receive a bonus. The debt covenant hypothesis expects that companies will report higher earnings the closer they are to violating a debt covenant in order to avoid this violation. According to the political cost hypothesis, companies have incentives to defer recognition of profits in order to avoid

excessive attention from regulatory or other bodies, which attention can cause increase of taxes or being monitored for monopolistic concerns.

2.1.4 Agency theory

Agency theory is an economics and management theory, which relates to the situation when a principal hires an agent to perform work on his behalf. Researchers have used it in various types of disciplines - from accounting and finance to political science. It is useful to explain relations between shareholders and managers because often companies (for example public companies) are not run by their owners. Instead, the owners (the principal) appoints the managers (the agent) to manage the company and to make decisions on the company operations. However, similar to the principal, the agent is a self-interested utility maximizer, which can contradict the interest of the principal (Fama & Jensen, 1983; Jensen & Meckling, 1976). Yet, capital markets can discipline managers (Fama, 1980). In addition, in order to align the interests of the agent with that of the company, the principal and the agent seal a contract. Based on it the manager receives compensation in the form of salary and/or bonuses depending on achieving certain goals. That compensation is regarded as the agency costs. Jensen & Meckling (1976, p. 6) define agency costs as "the sum of:

1. the monitoring expenditures by the principal;
2. the bonding expenditures by the agent;
3. the residual loss."

Monitoring expenditures include costs for monitoring the agent, for example, the board of directors. Bonding costs are contractual obligations that limit the activities of the agent or impose duties on him. The residual loss arises from actions of the manager that to do not maximize the value of the company.

Because the principal is not actively involved with the company, a way in which he evaluates the manager's work is by the mandatory and voluntary disclosures that the firm makes. However, often the manager has discretion over the mandatory reporting, which he can take into his advantage (Fields et al., 2001). For instance, the manager can aggregate segments with poor performance together with those that performed well. The manager has full discretion over the voluntary disclosure of the firm. What motivates and influences managers to decide on how to

apply accounting standards are “contracting, asset pricing, and influencing external parties” considerations (Fields, Lys, & Vincent, 2001, p.261).

2.1.5 Signaling theory

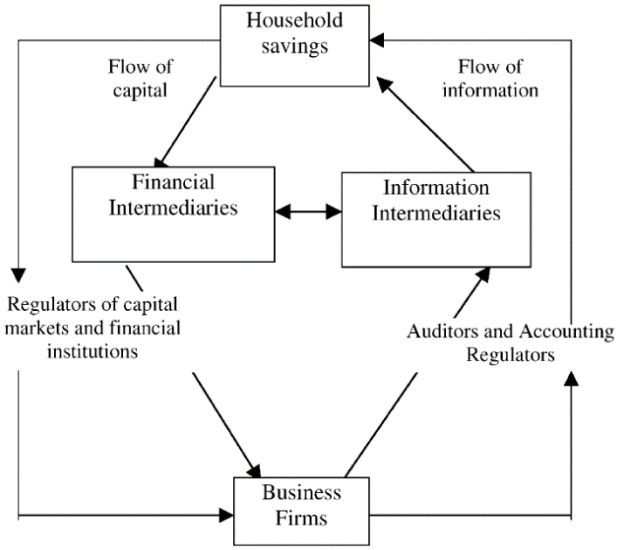
Following from the agency theory, managers possess more information than other stakeholders of the firm, such as investors and owners. This creates the problem of information asymmetry. To reduce that asymmetry, managers use signals in order to show that the company operates well and has a good and sustainable performance (Shehata, 2013). Spence (1973) initially developed the signaling theory. He observed the job market as a setting in which signaling occurs and views hiring employees as an investment under uncertainty due to the uncertainty of their productivity. The employees signal higher productivity through obtaining education, which is costly (time, monetary, psychic costs, for example stress) to them. It reduces information uncertainty between the employer and employees. For the signal to be credible, it should be costly, but less costly for the productive employees to obtain the signal (education) than to the unproductive, otherwise all employees will obtain it (Morris, 1987; Spence, 1973).

Signals can be applied in all settings with information asymmetry in which signaling of the party with better information can be beneficial to him (Morris, 1987; Verrecchia, 1983). Such signal in accounting research is voluntary disclosure as well as discretionary disclosure (Verrecchia, 1983). By disclosing more than they are required, companies hope to signal performance or value of the company to attract more investments (Campbell et al., 2001; Hughes, 1986). Signals are regarded as credible, because they reverse, so if they are misleading and overly optimistic, they will first manage to inflate share price, but at the end of the period analysts will compare the expected to the actual estimate, correct their estimates and share prices of the company will drop (Healy & Palepu, 2001). Thus, companies have an incentive to signal truthfully, which can solve the adverse selection problem. For a disclosure to be a signal, managers should have a discretion over it, a choice whether to disclose it or not. For that reason, voluntary disclosure can be regarded as a signal to investors, by which they demonstrate their readiness to provide detailed and disaggregated information.

2.1.6 Capital need theory

Another theory that helps explain why companies disclose information voluntarily is the capital need theory (Shehata, 2013). In order to operate and grow, companies are in need of external financing. Investors have funds, but often little knowledge on how to choose in which companies to invest. They need to evaluate the performance of the companies, they have invested in, for this reason they are in need of information. Analysts serve as an intermediary between the investors and companies by evaluating the latter. Figure 1 illustrates the flow of capital and information between investors and companies.

Figure 1: Flow of capital and information between investors and companies



Source: Healy & Palepu (2001, p. 408). This Figure illustrates how capital and information flow between investors (households) and companies. Money flows from the households to the companies either directly, through private equity for example, or indirectly through banks and other financial intermediaries. Information, again, can flow between companies and households directly – through financial reports or indirectly - through information intermediaries, such as analysts (Healy & Palepu, 2001).

However, analysts have less information than the management of the company, from which arises the information asymmetry problem. In contract theory, information asymmetry exists when one party to a transaction has more knowledge relevant to the transaction than the other party. Because investors do not know the inside working of a firm, this creates information asymmetry, which is present even if capital markets are efficient (Healy & Palepu, 2001). For example, managers can

be better at evaluating the outcome of a project. The information asymmetry is often used as a justification for regulation in accounting (Scott, 2012).

Analysts and investors address this problem by regarding the information asymmetry as risk of not accurately knowing the position of the company and incorporate this risk into the cost of capital, thus increasing it. Information asymmetry lowers liquidity, thus the attractiveness of the companies' shares decreases, which forces companies to sell their shares at a discount to compensate for their lower liquidity (Leuz & Verrecchia, 2000).

Companies have incentives to reduce the cost of capital, thus seek for ways to reduce information asymmetry. One way is through providing information that is required by regulators and law and is checked by other parties such as auditors, which make it look more reliable. Still, managers have discretion over mandatory reporting, thus quality of it differs among firms. Apart from mandatory reporting, managers often voluntarily reveal information on top of what they are required to the public. A reason for this is that investors require information about the performance and risk of their investments. Higher levels of voluntary disclosure reduce information asymmetry between managers and investors. By providing more information companies reduce information asymmetry and thus the costs to investors arising from risk related to this asymmetry (Cheng, et al., 2005; Leuz & Verrecchia, 2000). The reduced information asymmetry, in turn, reduces cost of capital. This leads to a higher market value of the firm, according to various valuation methods, which illustrates the value of voluntary disclosure to investors.

2.1.7 Proprietary costs theory

According to discretionary theory, proprietary costs can affect the amount of information a company provides (Leuz, 2003). Proprietary costs are costs to competitive position of revealing valuable information to competitors, for example the high abnormal profitability of segments, in which the firm operates. If these segments are revealed and sufficient information about them is provided for a good understanding of these segments, competitors may be motivated to capture that abnormal profit, which leads to increasing competition, and hence a decrease of the firm's profits in that segment (Berger & Hann, 2007). As proprietary costs increase, corporate disclosure quality decreases (Cohen, 2002; Leuz, 2003). Thus if firms increase their mandatory reporting quality by revealing profitable segments, they may in turn compensate this by decreasing voluntary disclosure on them in order to preserve their competitive advantage.

2.2 Summary of theoretical background

This chapter presented relevant to the research theories in economics, management and accounting. It gave definitions to terms used in the research. It discussed the reasons why companies need to disclose information, the reasons they provide it and what affects their disclosure. Information asymmetry and agency problems are the primary reasons why disclosure is necessary. Chapter 3 will discuss prior research, related to the effects of SFAS 131, voluntary disclosure and mandatory reporting and their measurement.

3. Prior research review

The third chapter discusses prior related research. It is divided into three sections. The first section provides an overview of related research on mandatory and voluntary disclosure and their interaction. The second section discusses prior findings on the quality of SFAS 131 standard. The third section looks at research on implementable proxies for voluntary disclosure, such as disclosure checklists and company guidance.

3.1 The interaction between mandatory reporting and voluntary disclosure

Prior research has been scarce in focusing on the interaction effect of mandatory reporting and voluntary disclosure, which provides a gap for research in this area. Mostly it has only looked at voluntary disclosure or mandatory reporting separately, not taking into account the effect of mandatory reporting on voluntary disclosure (Einhorn, 2005). Mangers have more information than all other parties, so if they are not required by accounting standards to provide that information, they would weigh the costs and benefits before doing so (Healy & Palepu 2001). Graham et al. (2001) mention the relationship between mandatory and voluntary reporting along with other incentives for voluntary disclosure such as capital markets transactions, increased analyst coverage, corporate control contest - increase of voluntary disclosure in order to explain underperformance; stock compensation, and signaling management talent. According to them, voluntary disclosures provide analysts and investors with the information they need, which is not required by mandatory reporting, thus quality of mandatory reporting and voluntary disclosure are expected to have an inverse relation. That claim is supported by three-fourths of the respondents to the survey, conducted for the authors' research. The authors also present possible constrains to voluntary disclosure such as setting a precedent that the companies may not want to follow in the future, litigation, proprietary and agency costs. McKinnon and Dalimunthe (1993) and Aitken et al. (1999) observe determinants of voluntary disclosure using Australia as a setting.

Central to this study is Einhorn's argument that firm's voluntary disclosure depends on the mandatory reporting standards and regulations (Einhorn, 2005). The author regards those types of disclosures as complementary. She claims that "unless no correlation exists between firms' mandatory and voluntary disclosures, mandatory disclosures may influence the incremental

informational content for investors of voluntary disclosures, and may therefore be a key determinant of the firms' discretionary disclosure strategies" (Einhorn, 2005, p. 594).

Cassell, et al. (2015) also explore the relation between reporting quality and disclosure, suggesting that when firms manage earnings, they disclose less information on the manipulated accounts. Floyd (2016) finds that investors' expectations of mandatory reporting quality affect the firms' voluntary disclosure in the MD&A section of the 10-K form[1].

Researchers tested the interaction of mandatory reporting and voluntary disclosure by looking at how a removal in a reporting requirement affects voluntary disclosure, especially regarding that requirement. Bischof and Daske (2012) show how a one-time disclosure requirement changes subsequent voluntary disclosure by employing EU stress tests of banks conducted and revealed in the period 2010-2011. The authors show that after the stress tests the voluntary disclosure of sovereign credit risk exposures of all banks in the sample substantially increased. The increase of voluntary disclosure in the periods after the stress test is a side effect, and it is, according to the authors, in accordance with a mandatory reporting shock decreasing the threshold for voluntary disclosure. An effect of change in mandatory reporting on voluntary disclosure was also found by Yu (2011). The author found that after SEC removed the requirement of providing reconciliations to US GAAP, firms increased their voluntary disclosure, especially regarding these reconciliations. This is an illustration of firms adjusting their voluntary disclosure in response to changes to mandatory reporting requirements.

Still, the relation between the required and voluntary disclosures is complex and can produce unintended consequences to amendments to reporting standards. Not always is increasing mandatory reporting requirements leading to an increase to reporting quality by being of value to investors, as the mandated disclosure could have been disclosed voluntary and the managers' choice whether to disclose it or not can be regarded as a signal, which carries additional information (Dye, 1985). Nor will a firm always disclose all valuable to investors information, even if it portrays a success of the company, due to proprietary reasons (Dye, 1985). What's more, if firms have a fixed amount of disclosure that they are willing to provide, increasing mandatory reporting requirements could decrease voluntary disclosure, in which case the two types of disclosure act as substitutes (Yang et al., 2013).

[1] 10-K form - disclosure, which public companies are required to submit annually to the Securities and Exchange Commission (SEC) and which discusses the company's annual performance and position.

In empirical research, that relation has often been examined using the IFRS adoption. Yang et al. (2012) find that after the adoption of IFRS of EU countries in 2005, companies in the adopting countries issued more management forecasts and issuing more forecasts was related with an increase in liquidity. Li and Yang (2015) find similar results - that management earnings forecasts were issued more frequently after the adoption of IFRS in 2005 for the companies in the adopting countries, also suggesting a reason for that "improved earnings quality, increased shareholder demand, and increased analyst demand" (Li and Yang, 2015, p. 3).

3.2 SFAS 131 as an exogenous improvement to mandatory reporting quality

Findings and conclusions of prior research regard SFAS 131 "Disclosures about segments of an enterprise and related information" as an improvement in segment reporting quality, with positive economic effects, especially due to an increase in the disaggregation of line of business segments (Berger and Hann, 2003; Ettredge et al., 2006). Berger and Hann (2003) assert that previous research had found that, with the adoption of SFAS 131, more segments are reported than prior to the adoption, which show that segment disaggregation increased. The researchers interpret this as that SFAS 131 allows less discretion in segment reporting and that managers used the older standard SFAS 14 to disclose less information on segment performance. Comparing restated pre-adoption segment data with data under SFAS 131, Berger and Hann (2003) show that the new standard increased the number of reported segments and this increase was useful to analysts in making predictions about the firm, evidenced by the fact that their forecasts became more accurate. In 2007 Berger and Hann managed to find that agency costs were the reason for segment aggregation under the old standard, so with the revealing of new segments, this study follows the assumption that the new standard more accurately discloses those in which the company operates in, thus is of higher quality. Moreover, according to Berger and Hann (2003, p. 167) the new standard provides "greater, but more individualized, insight into the management strategy of each firm" by employing the management approach, contrary to the criticized for the ambiguity of the industry definition industry one.

Using a different proxy for the effect of SFAS 131 - the cross-segment variability of segment profits, Ettredge et al. (2006, p.5) show an increase of this variability, which represents an increase in the "diversity in operating results". The authors interpret the results of their research as showing that the disclosure of segments became more transparent. Similar to Berger and Hann (2003),

Botosan and Stanford (2005) also researched the effect of the standard on analysts' environment. The authors show that after SFAS 131 adoption, the consensus in analysts' forecasts increased, which means that analysts increased their reliance on public information instead of a combination of public and private information. This, in turn, shows that the additional public information, supplied after the adoption of the standard, was useful to them.

3.3 Measurement of disclosure

This study requires measurement of disclosure, which can be problematic. Measuring disclosure is a major issue in studies that rely on it. The reason for this is that disclosure is a "theoretical concept that is difficult to measure directly" (Hassan and Marston, 2010, p. 3). Healy and Palepu (2001) present three ways to measure disclosure - AIMR scores, management forecasts and disclosure checklists. Hassan and Marston (2010) divide the types of disclosure proxies into direct - those that examine the source of disclosure and indirect proxies - those that rely on data other than the original disclosure. Examples of a direct proxy are creating a disclosure index- creating a list of mandatory and/or voluntary information items, manual or automated content analysis, management forecasts, etc. Examples of indirect proxy are the attributes of analysts' forecasts - the number of analysts following; disclosure surveys - FAF/AIMR scores, etc. Researchers often used disclosure checklists to measure disclosure, also to measure segment level disclosure (Hassan & Marston, 2011). André et al. (2015) used the disclosure of segment-level line items as a proxy for segment disclosure quantity.

The second way, indicated by Healy and Palepu (2001) - measuring voluntary disclosure through management forecasts, is less often used by researchers than historical disclosure, included in the notes to the financial statements (Moldovan, 2015). It was implemented by Moldovan (2015) and Yang, Karthik, & Xi (2013). Moldovan (2015) used whether companies provide segment level guidance as a proxy for voluntary segment disclosure. She found that when companies provide segment level guidance, whether it is a point estimate, range estimate or narrative, analysts forecast errors decrease. She regarded this as evidence for the supposition of John Dawson, the chairman of the Investor Relations Society (IR Society) that "directional and qualitative guidance is as effective as quantitative profit forecasts" (Moldovan, 2015, p.178 citing Roach (2013b)). Yang, Karthik, & Xi (2013) and Li and Yang (2015) used whether companies provide management forecasts and the number of these forecasts per year in order to study whether

the adoption of IFRS affects voluntary segment disclosure. Table 1 provides a summary of the prior related research:

Table 1: Summary of key related research

Interaction between mandatory reporting and voluntary disclosure				
Title	**Author & Year**	**Method**	**Sample Data**	**Main findings/Conclusions**
"Mandatory Financial Reporting and Voluntary Disclosure: The Effect of Mandatory IFRS Adoption on Management Forecasts"	Li and Yang, (2015)	Difference-in-difference method to study the effect IFRS adoption on management forecasts. Test three channels explaining the increase in management forecasts.	20,292 firm-year observations from 26 countries and control sample of 60,585 firm-year observations from 17 countries; Sample period: 2002-2010	Increase in the likelihood and frequency of management earnings forecasts after IFRS adoption.
"Mandatory Supervisory Disclosure, Voluntary Disclosure, and Risk-taking of Financial Institutions"	Bischof and Daske (2012)	Difference-in-differences design to test change in voluntary disclosure of stress-test items after 2010 and 2011 EU banks stress tests	2,012 reporting periods (quarters or half-years) Sample period: 2009 - 2011	After the stress tests the voluntary disclosure of sovereign credit risk exposures of all banks in the sample substantially increased.

Table 1: Summary of key related research (continued)

SFAS 131 as reporting quality improvement				
Title	**Author & Year**	**Method**	**Sample Data**	**Main findings/Conclusions**
"The Effect of SFAS No. 131 on the Cross-Segment Variability of Profits Reported by Multiple Segment Firms"	Ettredge, (2006)	Observing SFAS 131 effect on cross-segment variability of return on sales and correlation between reported and inherent cross-segment variability of return on sales	From 1,033 to 1,293 multiple segment firms; Sample period: 1994–2000; Sample data source: Compustat	An increase in cross-segment variability of segment profits. The disclosure of segments became more transparent.
"The Impact of SFAS No. 131 on Information and Monitoring"	Berger and Hann, (2003)	Compare number of segments and level of disaggregation under both standards. Compare the accuracy of one year ahead forecasts under both standards.	2,999 US companies with minimum sales of $20 million; Sample period: 1997 and 1998 annual reports.	SFAS 131 increased the number of reported segments and the disaggregation of segments. Forecast accuracy also increased.

This table summarizes key prior research on the interaction between mandatory reporting and voluntary disclosure and on the effects of the adoption of SFAS 131.

3.4 Summary of Chapter 3

Chapter 3 looked at related research on the interaction between mandatory reporting and voluntary disclosure, which is scarce and represents a current gap in the accounting literature, and provides opportunities for further research. Further, it showed that prior research regards the adoption of SFAS 131 as an exogenous improvement to reporting quality, which justifies its use as a proxy for reporting quality improvement for this research. It also presented different types of disclosure measurements, used in prior research, such as disclosure checklists and managers' forecasts.

Chapter 4 will develop the hypotheses, empirically tested in the current research, and will discuss the validity of the research.

4. Hypotheses development

The first Chapter presented the research question:

RQ: Does the improved quality of mandatory segment reporting affect voluntary segment disclosure?

Chapter 4 focuses on the development of hypotheses in order to answer the research question of whether there is significant evidence of interaction between mandatory reporting quality and voluntary disclosure. It also discusses the Predictive validity framework ("Libby boxes"), which shows how the constructs are operationalized in order to be empirically researched. Based on the "Libby boxes", this chapter also discusses the validity of the research.

4.1 Hypotheses

The first Chapter presented the research question:

RQ: Does the improved quality of mandatory segment reporting affect voluntary segment disclosure?

In order to answer the research question and based on prior research and theory, the paper develops one hypothesis. The hypothesis is stated as a null hypothesis due to the ambiguous theoretical predictions - both an increase and a decrease of voluntary disclosure is possible. Therefore, the paper tests the following null hypothesis:

> *H_0: An increase in mandatory reporting quality has no effect on voluntary disclosure of information regarding segments in financial reports.*

The alternative hypothesis is that:

> *H_1: An increase in mandatory reporting quality has an effect on voluntary disclosure of information regarding segments in financial reports.*

4.2 Possible reasons for an increase and for a decrease of voluntary disclosure

The reason the hypothesis is non-directional is that it is unclear how the change to SFAS 131 could influence voluntary disclosure of segments. It can be argued that when mandatory disclosure quality is low, the information asymmetry between managers and shareholder would be large, so

firms would want to voluntarily disclose more in order to decrease that asymmetry and lower the cost of capital. It may be the case that the improved reporting quality may lead to managers providing information on the segments that they were previously hiding behind an aggregate. In such cases, an increase of voluntary disclosures regarding those segments can be expected, as managers would no longer have incentives to hide them, for example if a profitable segment was disclosed under the new standard, managers may start voluntarily disclose more about it, given the firm's participation and performance in it is no longer secret. Conversely, if a segment with abnormally low profitability was disclosed, managers would have an incentive to give explanations about it, due to increased scrutiny. As Cassell et al. (2015) show, managers do not disclose information for problematic accounting items. However, if mandatory reporting had already required them to disclose that problematic information, they can freely voluntarily provide more in order to gain the benefits associated with increased disclosure. In addition, firms may disclose more information about the previously aggregated segments, because financial information users may negatively interpret the absence of such information.

On the other hand, there are reasons why we might question an increase in voluntary reporting after the new standard. The proprietary, agency and preparation costs may be higher than the estimated by the firms' benefits from additional disclosures, which would decrease the likelihood of that disclosure.

4.3 Voluntary disclosure as a cost-benefit tradeoff

The reasons the study could expect an increase in voluntary segment disclosure, is that as the adoption of the "management approach" which led to a disaggregation of segments and reporting of new ones better reflects the segments the company operates in, investors may more favorably evaluate voluntary disclosure related to them. In addition, voluntary disclosure, related to overly aggregated segments of different types of operations, would be of far less interest and informational value to investors. Thus after the segments become disaggregated, the importance of voluntary disclosure increases, thus the potential positive effect of voluntary disclosure increases and therefore the incentives of the companies to disclose them. In such case, the *benefits* of disclosure increase. At the same time *costs* of disclosure increase as well. With the increase of disaggregation of segments, segments that were previously hidden for proprietary reasons now are

visible. This makes it more costly to provide additional information to those segments because of proprietary concerns.

4.4 Libby Boxes

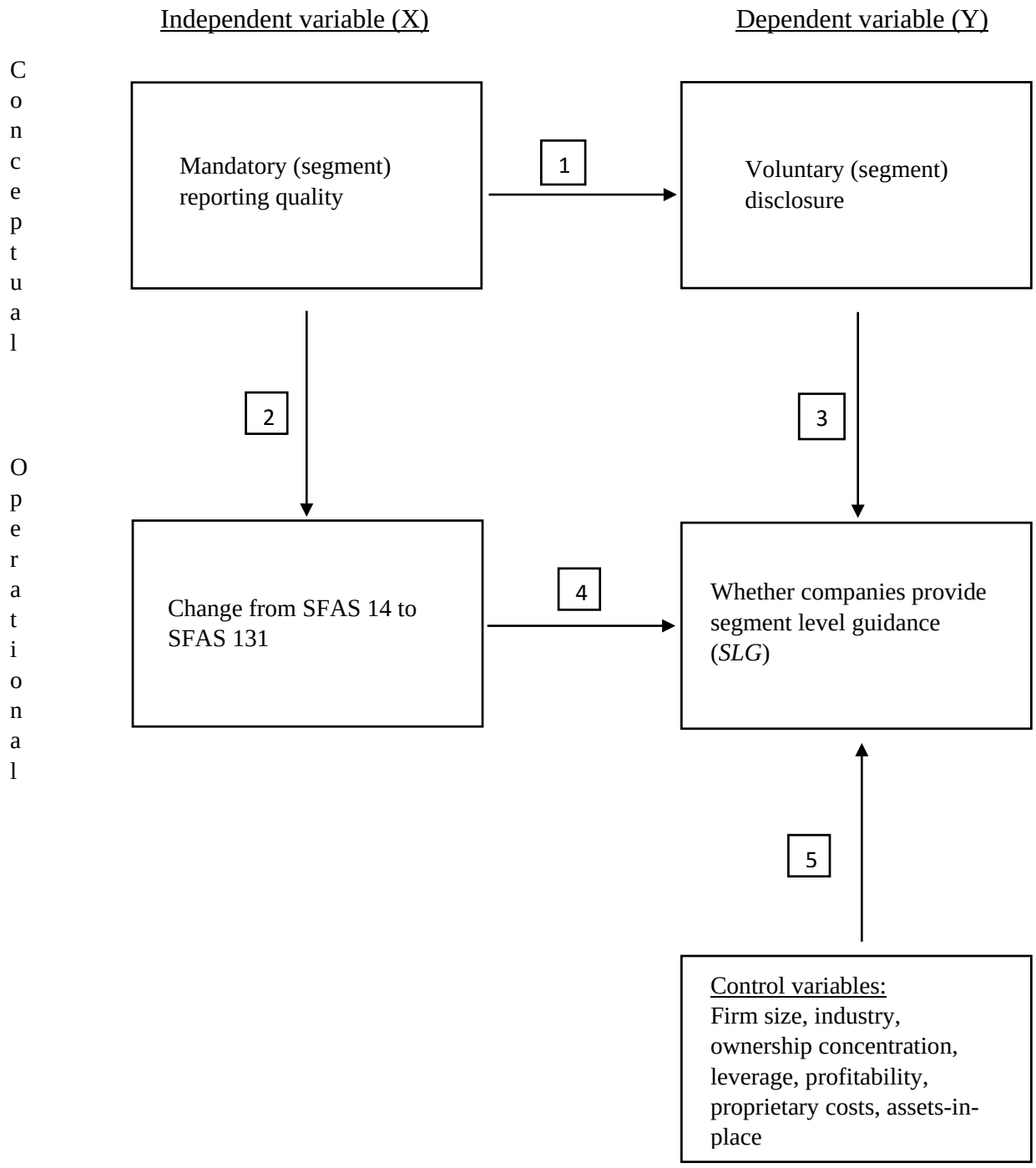
In order to test the null hypothesis, the concepts of mandatory reporting quality and voluntary segment disclosure would be operationalized with the adoption of SFAS 131 and whether companies disclose segment level guidance in the financial statements, respectively. The predictive validity framework ("Libby boxes"), developed by Libby et al. (2002), which is shown in Figure 2, depicts that operationalization process.

Constructs, such mandatory reporting quality and voluntary disclosure, are ideas that are impossible to be observed and measured. Link 1 in the "Libby boxes" show the relation between these two unmeasurable concepts, mandatory reporting affects voluntary disclosure. As is hypothesized under the alternative hypothesis, changes in reporting quality can influence voluntary disclosure.

As this research is quantitative, it requires data with assigned numeric values. However, the constructs are unmeasurable. They can only be measured by variables that can be observed and can have numeric values. Links 2 and 3 show how the constructs are operationalized in order to be measured. Link 2 shows how mandatory reporting quality is operationalized by the adoption of SFAS 131, which is assumed to improve that quality, through a dummy variable (0, 1). Respectively link 3 shows the way voluntary disclosure is operationalized - through the disclosure of segment level guidance in the financial statements.

Link 4 shows the relation between the operational measures. By using specific variables in the operationalization - regarding segments, link 4 can be relatively strong. It is easier to track effect and to attribute effect of change of one standard to the related to it items, than of a global accounting change to a global measure of disclosure, such as AIMR scores. Link 5 indicates control variables that based on prior research can influence voluntary segment disclosure. They are necessary to be added to the model, so that potential changes to the dependent variable can be attributed to the changes in the independent variable and not of other correlated variables.

Figure 2: Predictive validity framework ("Libby boxes")



This figure shows how the constructs are operationalized in this paper and the relation between the constructs and the operational variables.

4.1 Validity

4.1.1 Construct validity

Construct validity relates to whether the measurement of the construct measures well that construct, which is evidenced by whether it behaves as is expected by theoretical predictions. For the proxies to be valid, when different researchers have used in the past, they should have obtained non-conflicting results (Carmines and Zeller, 1991). The proxy for voluntary segment disclosure is whether companies provide segment level guidance, based on Moldovan (2015). This forward looking information on segments is important to investors to value the company. If provided, analysts' forecasts errors decrease (Moldovan, 2015). That is why it is a relatively valid proxy for voluntary segment disclosure, compared to if it wasn't already been used by Moldovan (2015). Also, it is measured by a dummy variable, which limits its subjectivity.

SFAS 131 as proxy for improved mandatory segment reporting quality had to the author's knowledge not been used as such by prior research. Still, consistent prior research findings and the conclusions of FAF[2] Post-implementation review (2012) argued it improved this quality, which is why it is used in this study. Also, it is measured by dummy variable (0,1), which can limit its subjectivity.

4.1.2 Internal validity

Internal validity relates to the extent to which the studies can claim causal effect between the independent and the dependent variable, without a high risk of confounding effects. Internal validity of this study is relatively low, because the research method is a natural experiment, but there is no control group, the counterfactual showing what would have happened had segment reporting quality not increased (SFAS 131 not been adopted). Even though the treatment is not random as it affects all companies, and the treatment is before the effect, because the companies in the sample are observed for two years, there is risk of confounding events - events, such as changes to the companies that affect their voluntary disclosure at the same time as the SFAS 131 adoption. Control variables, found by prior research to influence voluntary disclosure, were added in order to reduce the risk of confounding events. For the same reason the sample period is short -

[2] Financial Accounting Foundation

only 2 years, the year before and the year after the adoption of the standard. This is necessary, as the further away in time the observation is from the adoption of SFAS 131, the more it is influenced by events other than the standard and the more the internal validity is reduced. Due to the risk of confounding events, the study does not claim causal relation between the constructs, but a relation of association. In addition, the internal validity depends on the how well the proxy for voluntary segment disclosure captures the construct it measures.

4.1.3 External validity

External validity relates to how the findings of the research are generalizable to other settings. The external validity of this research is relatively low due to the limited sample of 167 companies[3] (334 observations for 2 years) after outliers' removal. The sample was limited to that manageable number due to the manual hand collection that the construction of the voluntary segment disclosure requires. In addition, the sample is not random. Yet, it includes companies from different industries and sizes. Nevertheless, as the sample is based on companies, included in Fortune 500 magazine, large companies may be overrepresented. The sample is also comparatively large, in comparison to studies on voluntary disclosure that require manual hand collection, so its external validity is at an acceptable level. Nevertheless, it includes only US companies, so the findings of the paper may not be generalizable to countries with different institutional and financial information environment.

4.2 Summary of hypotheses development

Based on the related research and the theoretical background, reviewed in Chapter 3 and 2 respectively, Chapter 4 developed the hypothesis. Because both benefits and costs of voluntary disclosure increase, the null hypothesis of the paper is two-tailed: The change in standards on segment reporting has no impact on voluntary disclosure. It is stated in a non-directional form as a null hypothesis, because both an increase and decrease of voluntary disclosure is possible. The intuition behind an eventual rejecting of this hypothesis is that the increase of reported segments, information asymmetry is expected to decrease. As there is a negative link between voluntary disclosure and information asymmetry, we can expect an increase in voluntary disclosure. Also,

[3] The process of sample formation can be found in Chapter 5, Section 3

with segments reported under the management approach, the usefulness to financial information users of additional voluntary information on them increases, so do the benefits of voluntary disclosure. However, due to costs associated with disclosure, such as preparation costs and proprietary costs there exists a possibility for a decrease in voluntary disclosure. The chapter also discussed the predictive validity framework, illustrating how the concepts are operationalized, and based on that operationalization, the validity of the study.

Chapter 5 will provide the research design, used to test the hypotheses.

5. Research design

This chapter shows how the study is executed. The research design is empirical analysis, which aims to find whether quality of mandatory segment reporting influences voluntary segment disclosure of companies. As a measurement of voluntary segment disclosure is not readily available, the study requires hand collection of information from annual 10-K reports of companies. This chapter is divided into three sections. The first section presents the statistical model used - logistic regression. The second section discusses the main and control variables that will be used in the model and their measurement and the expected signs of the explanatory variables. The third section shows the formation of the sample and the data collection process. The fourth section provides the results from various statistical tests that are applied to the data - tests for outliers and multicollinearity and discusses heteroscedasticity.

5.1 Model specification

To estimate the effect of the SFAS 131 adoption on voluntary disclosure, the researcher uses multiple logistic regression analysis in which the main explanatory variable is a dummy variable for SFAS 131, which equals 1(0) for post-SFAS 131 (pre-SFAS 131) and to which control variables are added. The software used to perform the regression analysis and all other tests is Stata, version 13.

The proxy for voluntary segment disclosure (the dependent variable) used is *SLG* - a dummy variable (0, 1) indicating whether the firm provides guidance on the segment level. As the dependent variable *SLG* is binary, it is most suitable to use logistic regression, which is widely used by researchers to model a binary dependent variable.

Logistic regression estimates the probability of an event occurring, in this paper, the probability of the provision of segment level guidance. In logistic regression, the dependent variable is restricted to be binary, while ordinary least squares (OLS) expects that it can take any value, in addition to 0 and 1 and is not restricted to predict only 0 and 1. For this reason, a binary regression model (BRM), such as logistic regression, is used.

The model is estimated using the following logistic regression:

$$\Pr(y=1|x) = F(\beta_0 + \beta_1 SFAS131 + \beta_2 Control_1 + \beta_3 Control_2 + ... + \varepsilon) \quad (1)$$

After including the control variables, the regression equation takes the following form:

$$\Pr(y = 1 \mid x) = F(\beta_0 + \beta_1 SFAS131 + \beta_2 SIZE + \beta_3 IND + \beta_4 LEV + \beta_5 PROFIT + \beta_6 AIPLACE + \beta_7 PROPRIET + \beta_8 OD + \varepsilon) \quad (2)$$

In this regression equations, F denotes the cumulative logistic distribution function and ε denotes the residual (error term) of the regression. *SIZE* measures the natural log of total assets, *IND* - whether the company is in the oil or mining industry, *LEV* - the indebtedness of the company, PROFIT - the return on equity, *AIPLACE* - the assets-in-place, *PROPRIET* - proprietary costs and *OC* - ownership concentration. The logistic regression is run with robust standard error to fix for potential heteroscedasticity.

If the null hypothesis is false and there was an increase (decrease) in the odds of providing voluntary disclosure, attributable to the adoption of SFAS 131, then the coefficient β_1 before the *SFAS13*1 dummy variable is expected to be positive (negative). If the null hypothesis is true and there was no significant change in voluntary disclosure, then the coefficient β_1 before the dummy variable should be 0.

5.2 Measurement of variables

5.2.1 The main independent variable- mandatory segment reporting quality

It is easy to measure the main independent variable - mandatory reporting quality through the transition to SFAS 131 through a dummy variable which takes the value of 1 after the adoption of SFAS 131 (1998 fiscal year end) and 0 before its adoption (1997 fiscal year end). SFAS 131 was chosen as a proxy following the results of prior literature, which are discussed in Chapter 3. Still, to further argue SFAS 131 as a proxy for improved reporting, the author manually collected the number of line items per segment in the financial statement's footnote for the year before and after the adoption of SFAS 131 for each company in the sample. 104 companies increased the number of segment line items after the standard's adoption, 13 decreased it, while for 50 companies it stayed the same. This shows that the total disclosure – required and voluntary, increased.

5.2.2 The dependent variable- voluntary segment disclosure

Potential measurements of voluntary segment disclosure

Measuring voluntary segment disclosure is more challenging than mandatory reporting quality and prior literature has not provided a consistent measure. As the annual report contains voluntary segment information along with the compulsory one, possible measures could be looking at additional disclosures over and above the mandatory minimum in the annual report. Another implementable measure is observing whether managers provide segment level guidance. The third potential implementable measure is observing whether managers provide more information about segments in the MD&A section of the annual report, which, however, is challenging to code, given it is a narrative.

This study uses a proxy for voluntary segment disclosure based on the second approach. The researcher considered using the proxy under the first approach - counting the number of voluntary segment line items in the annual report other than the mandatory ones, for example cash flow, liabilities, research and development expense, personnel training costs and marketing costs, restructuring expenses, etc. However, few firms provided such items given the fact that the standards already mandate a large number of items, while many firms provide less than is required. Moreover, additional problems are being caused by the fact that SFAS 131 requires more items than SFAS 14, which means that several items that were voluntary in SFAS 14 - income tax and interest expense, interest revenue, and significant noncash items become mandatory under SFAS 131. This can cause problems, because the mere application of SFAS 131 can automatically decrease voluntary disclosure. What's more, many of the mandatorily required by SFAS 131 items are required only if the chief decision officer reviews them, which make it to the discretion of mangers whether to provide them. Appendix H provides a further discussion of mandatory and voluntary items.

Measurement of voluntary segment disclosure chosen

The proxy for voluntary segment disclosure that is used in this research is the one under the second approach - segment level guidance (*SLG*). It is measured through a dummy variable, which takes the value of 1 when the company provides segment level guidance and 0 when it does not. *SLG* is equal to 1 if the company provides any forward looking information about all of its segments- regardless if it is point estimate, range or just narrative description of the expected outlook of the segment. The place for such guidance is generally the MD&A section of the financial statements,

included in 10-K filing to the SEC. *SLG* being a dummy variable does not differentiate between the precision of the guidance. As Moldovan (2015) shows, the effect of these three types of segment level guidance on analysts' forecast errors is the same. According to her results, all of them lead to a decrease in the forecast error regardless of their precision. For this reason and with the aim of avoiding subjectivity in its measurement, *SLG* takes only 2 values.

5.2.3 Control variables

In order to control for effects that alter the voluntary segment disclosure beyond the standard change, control variables are added to the logistic regression. Those variables are determinants of voluntary disclosure and the author includes those that influence segment disclosure, indicated by McKinnon and Dalimunthe (1993), Aitken et al. (1999) to be statistically significant and strongly supported by the authors, as well as variables, indicated by other researchers. The method for their measurement is provided in Table 2 and in Appendix A. All variables, except for SLG, which is hand collected, are obtained either directly from the Compustat database or after performing calculations on data, collected from Compustat.

SIZE refers to firm size. It is calculated by the natural log of total assets. Following Leftwich, Watts, & Zimmerman (1981), size is positively related with outside capital. According to Jensen & Meckling (1976), as outside capital increases, so do agency costs. Thus the higher the agency costs, the more benefits are from voluntary disclosure (Chow & Wong-Boren, 1987). Given this theoretical predictions, the coefficient before *SIZE* is expected to be positive.

IND represents industry and takes the value of 1 for companies in the oil and gas or mining operations and 0 otherwise. As these are politically sensitive industries, they may provide more voluntary information, thus the coefficient before *IND* is expected to be positive (McKinnon and Dalimunthe, 1993).

OC measures ownership concentration (the inverse of ownership diffusion). It is calculated based on Lan, Wang, & Zhang (2013) as the average percent of total shares outstanding owned by a shareholder. Potentially, the lower the ownership concentration, the less control and access to inside information the owners have, so the more voluntary information is expected. Also, if ownership is more concentrated, instead of disclosing in financial statements, companies can communicate with the owners through other channels, for example the board of directors (Leuz, 2003). Therefore, the coefficient before *OC* is expected to be negative.

LEV is controlling for leverage, as it can affect voluntary disclosure, too. It is calculated as long term debt divided by total assets, similar to Yang, Karthik, & Xi (2013). More leveraged firms have higher agency and monitoring costs, so in order to reduce them, they can be more likely to disclose voluntary information (Fama & Miller, 1972; Jensen & Meckling, 1976). Thus, the coefficient before *LEV* is expected to be positive.

Another control variable, not indicated by McKinnon and Dalimunthe (1993), but by other researchers, *PROFIT*, measured by ROE, represents the profitability of the company, which could positively influence voluntary segment disclosure, due to mangers' willingness to signal good news to the market. Several researchers found such influence (Mardini, Tahat, & Power, 2013; Prencipe, 2004). Some studies found it having a significant positive relation with voluntary disclosure, others negative, and some studies found it be insignificant (Leuz, 2003; Giner et al., 1997), so the sign of the association is not predicted before performing the regression analysis.

PROPRIET measures proprietary costs. It is calculated as the current year's revenues growth equal to current year's revenues minus previous year revenues divided by previous year revenues. It is expected to be negatively related with voluntary segment disclosure based on Graham et al. (2005), who, surveying 401 financial executives, found that around three fifths of the respondents agree that proprietary costs can be an obstacle to disclosing voluntarily.

AIPLACE (Assets in place) measures the ratio of net property plant and equipment divided by total assets of the company, and shows the barriers to entry in the companies' business. Potentially, the higher the barriers to entry are, the more willing are companies to provide voluntary disclosure to capital markets, as it will be less costly to them (Lan, Wang, & Zhang, 2013; Leuz, 2003). However, according to Myers (1977), when a company has already acquired its assets, the agency costs are lower, consequently the need for voluntary disclosure is also lower. Accordingly, the sign of the coefficient before assets-in-place can be both positive and negative, so no preliminary expectations for the sign of this variable are made. This variable is also used by Chow & Wong-Boren (1987). The predicted sign of all independent variables, included in the model, is summarized in Chapter 6, Table 7.

Table 2 presents the measurement of the control variables:

Table 2: Control variables

Variable name	Variable description	Method of calculation of variable
SIZE	Firm size	Natural log of total assets
IND	Industry	Coded as 1 in case of oil and gas or mining operations, otherwise coded as 0
LEV	Leverage	Long term debt divided by total assets
PROFIT	Profitability	Return on equity (ROE) = Net income / Equity
AIPLACE	Assets in place	Property plant and equipment Net (without depreciation) divided by total assets
PROPRIET	Proprietary costs	Revenues growth = Revenues – Previous year Revenues / Previous year Revenues
OC (in percentage)	Ownership concentration	Average percentage of shares outstanding, owned by one shareholder = [Total number of shares outstanding / total number of shareholders) / Total number of shares outstanding] *100

This table shows the control variables, added to the logistic regression, along with the method for their calculation. Their aim is to control for factors, other than the adoption of SFAS 131, which can have an influence on voluntary segment disclosure. All variables are additionally described in Appendix A.

5.3 Sample selection

The sample consists of a hand collected dataset of 173 large US firms. Because the sample is hand collected and due to hand collected information for segment level guidance, that is needed to extract from the firms' financial statements, which is labor intensive, the sample size is limited to that manageable number. The sample period is 2 years - the fiscal year end when firms adopt SFAS 131 (December 1998) and the pre-adoption fiscal year end (December 1997), so the data is panel. The author collects and examines the 10-K filings for those 2 years under the different standards. It is necessary to collect information for two years under the two standards in order to compare voluntary disclosure between these two years.

Due to the time-intensive process of obtaining data for voluntary segment disclosure, similar to Herrmann and Thomas (2000), the data collection process starts from the largest firms from 1998 Fortune 500 listing. Fortune 500 is an annual list of 500 the biggest by revenue U.S.

companies. It is created by Fortune magazine and includes both public and private companies. Excluded are firms that are not found in the SEC EDGAR[4] database (11 companies), together with those which do not have 10-K filings, covering the reporting periods ending December 1997 and December 1998, available on the SEC EDGAR database (18 companies) and duplicate or merged companies (4 companies). The data collection process also excludes financial institutions, real estate companies and insurance (SIC 6000-6799) as their disclosure will be significantly different from that of the others (152 companies). It excludes *undiversified* companies- those that provide no segment reporting in *both* years (23 companies). Companies that report only one segment under SFAS 14 are not necessarily undiversified, as they can be hiding other segments. That is why the SEC filing under SFAS 131 is also reviewed and only if the company provides no segment reporting under both standards (if the company provides no segment information at all or if it reports only one segment), the company is regarded as undiversified and excluded from the sample. As SFAS 131 became first effective for December 1998 fiscal year end, similar to Herrmann and Thomas (2000) companies with different than December 1998 fiscal year end are removed, unless they are early adopters of the standard and have adopted the standard for fiscal year end 1998 (103 companies). Early adopters of SFAS 131 (companies which adopted SFAS 131 before 1997 fiscal year end) are also removed (6 companies). Potential effects to segment disclosure required the removal of firms that have significant changes to operations for those years (4 companies). The final sample consists of the 173 firms that meet the above criteria. The total company-year observations are 334.

Appendix B illustrates the sample collection procedure. Appendix F shows the distribution of companies in the sample by industry (after outliers' removal).

5.4 Statistical tests

5.4.1 Outliers and Descriptive statistics (before removing outliers)

Before proceeding with tests and analysis of the data, it is necessary to observe its descriptive statistics, which can indicate whether there are any errors or extreme outliers in the data. Outliers are extreme observations - either too large or too small that can bias the estimates of the regression and thus the inferences that can be made from the data. As the goal of the paper is to observe the

[4] SEC Electronic Data Gathering, Analysis, and Retrieval system (SEC EDGAR) is a database, which contains companies' mandatory forms, which are filed to the SEC.

effects of SFAS 131 on the average firm, removing extreme outliers is necessary. Moreover, similar to the linear regression, the logistic regression is sensitive to outliers and influential observations[5] (Nurunnabi & Nasser, 2009). Appendix A provides the descriptive statistics of all variables, included in the model.

Table 3: Descriptive statistics (with possible outliers)

Variable	N	Mean	Median	SD	Minimum	Maximum
SLG	346	0.283	0.000	0.451	0.000	1.000
SIZE	346	8.945	8.876	1.136	6.087	12.783
LEV	346	0.237	0.234	0.124	0.000	0.731
PROFIT	346	0.184	0.145	0.462	-4.083	3.990
SFAS131	346	0.500	0.500	0.501	0.000	1.000
PROPRIET	356	0.089	0.049	0.334	-0.886	3.860
IND	346	0.075	0.000	0.264	0.000	1.000
AIPLACE	346	0.399	0.377	0.211	0.030	0.917
OC (in %)	346	1.170	.00003	10.704	0.0001	100

This table depicts various statistics for all variables, included in the model. The data, described in the table is before removal of outliers. Column "N" shows the number of observations. Column "SD" shows the standard deviation.

The descriptive statistics in Table 3 are inspected for unrealistic and erroneous values, for example unrealistic ratios. No obvious errors were spotted. Next, the data is tested for outliers. As variables *SLG*, *IND* and *SFAS 131* are binary (0,1), none of their observations can be regarded as outliers. All non-dummy variables distributions were examined using histograms (command ".hist" in Stata) and 3 of them had outliers. The histograms can be found in Appendix C.

From the descriptive statistics it is evident that ownership concentration (OC) has a large range from almost 0 to 1, which shows that outliers in the upper end probably exist. It is the most extreme case of outliers in the dataset. Being equal to 1, which means that the company has 1 shareholder with 1 share, is not necessarily a mistake, however the logistic regression is sensitive to outliers and in their presence the results can be biased (Nurunnabi & Nasser, 2009). Looking at the histogram of Ownership Concentration confirms this assumption of outliers. After using the

[5] A test for influential observations can be found in Chapter 6, Section 3, Sub-section 1.

command ". list", Stata output indicated that 4 observation (2 firms for 2 years) had a value of 1 for OD. These companies are removed to fix for these outliers.

Proprietary costs have outliers in the higher end of the distribution, with extreme values of 3.86 which is the maximum value, while the average is 0.089 and the median is 0.049. After listing those with values larger than 2, 2 distinct companies were listed. They are removed. Profitability had outliers both in the lower and in the higher end of the distribution. The minimum value is -4.083, the maximum is around 4, while the mean and SD are 0.184 and 0.462 respectively. After listing the observations with values larger than 3 and smaller than -2, three observations from two distinct companies were listed. They are also removed. The Assets-in-place (*AIPLACE*) variable appears to be bimodal. No outliers are detected in this variable. Extreme observations are not detected in the leverage variable, either. Size, which is measured by the natural logarithm of total assets, is slightly skewed to the right, however after looking at the actual companies with the highest values, it is evident that the values are not mistakes. With minimum of 6.087 and maximum of 12.783 while the mean is 8.945, the observations are considered meaningful and not extreme and thus are not removed as outliers.

After removing all outliers, the sample size decreased by 9 observations. However, as some companies were deleted only for one of the 2-year sample period, the panel becomes unbalanced. That is why, further the companies that had no 2-year data were removed, decreasing the sample with further 3 observations. The total effect of outlier removal on the sample size were 12 observations. After outlier removal the problem with outliers is reduced.

5.4.2 Collinearity diagnostics

Before performing the logistic regression, the data is inspected for multicollinearity. Multicollinearity is present when the independent variables are highly correlated with each other, which can bias their coefficients in an OLS regression model as the correlated variables will explain the same variance in the independent variable and their unique effect remains unknown (Acock, 2008). Similar is the problem of multicollinearity for a logistic regression. The presence of multicollinearity is tested using two methods. The first is by inspecting a correlation matrix of the independent variables. Table 4 shows the correlation matrix. If a correlation is above 80%, this can signify high multicollinearity problems (Midi, Sarkar, & Rana, 2010). If strong

multicollinearity is present, a possible solution is excluding a correlated variable from the model. According to Table 4, most of the variables have low correlations. The highest correlation is -0.383, which is between size and ownership concentration. This shows that the risks of multicollinearity are not serious.

Table 4: Correlation matrix for the independent variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) SLG	1.000								
(2) SFAS131	0.119*	1.000							
(3) SIZE	0.128*	0.042	1.000						
(4) PROFIT	0.034	-0.003	0.080	1.000					
(5) LEV	0.107	0.013	0.060	-0.178*	1.000				
(6) PROPRIET	-0.180*	-0.155*	0.122*	-0.072	0.034	1.000			
(7) IND	0.211*	0.000	0.132*	-0.091	-0.005	-0.097	1.000		
(8) AIPLACE	0.171*	-0.010	0.147*	-0.172*	0.358*	-0.022	0.282*	1.000	
(9) OC	-0.098	0.003	-0.383*	-0.052	-0.095	-0.045	-0.064	-0.196*	1.000

This table presents Pearson correlations between the independent variables.

* shows significance at 0.05 significance level for testing whether the correlation is different than zero. The higher the value, the higher the correlation between the variables. A value of 1.000 shows the highest and 0.000 the lowest correlation possible. The highest correlation between variables is -0.383. The correlations results are for the data after the removal of outliers.

The second method for testing for multicollinearity is by conducting a Variance Inflation Factor (VIF) test. VIF is a widely used test that shows the extent to which a variable is correlated with the other variables (Acock, 2008; Rawlings et al., 2001). Several researchers regarded variance inflation factors above 10 or 30 respectively to be indicators of multicollinearity (Acock, 2008; Rawlings et al., 2001). In logistic regression, variance inflation factors higher than 2.5 can also often indicate multicollinearity problems (Midi et al., 2010). Table 5 presents the results from VIF test. As the VIF values are low and very close to 1, all variables are included in the regression model.

Table 5: Variance inflation factor (VIF) test for multicollinearity

Variable	VIF
AIPLACE	1.32
SIZE	1.23
OC	1.21
LEV	1.19
IND	1.13
PROFIT	1.08
PROPRIET	1.07
SFAS131	1.03

This table displays the variance inflation factor (VIF) test for multicollinearity. The minimum value of a VIF and the value showing minimum multicollinearity, is 1. The higher the VIF value, the larger the risks of multicollinearity. As the VIF values, presented in this table, are close to 1, they are considered to show low levels of multicollinearity. Serious multicollinearity issues are generally assumed to arise at values above 10 or above 2.5 for logistic regressions. The VIF results are for the data after the removal of outliers.

5.4.3 Heteroscedasticity

Heteroscedasticity is an issue which arises when the error term (residual) of a regression is not constant (homoscedastic). The error term is homoscedastic if it is distributed with the same variance across all different observations of the independent (x) variable, and heteroskedastic if it is not. Generally, heteroscedasticity is a problem which can bias the estimates of a regression.

To the author's knowledge, Stata does not provide a test for heteroscedasticity for logistic regression, as opposed to the White and Breusch-Pagan test for OLS regression. For this reason, all regressions in this paper use the heteroskedastic robust option in Stata by adding ", vce(robust)" to the Stata logistic regression code which can help in solving for possible heteroscedasticity and other misspecification.

5.5 Summary of research design

Chapter 5 presented the research design - the way the study is executed. It discussed the statistical model, all variables used, the way voluntary segment disclosure measurement could potentially be measured and the way it is calculated in this study - through whether companies provide guidance on the segment level. It presented the sample formation process and sample size.

It also showed the descriptive statistics of the variables, discussed outliers and potential solutions for this problem and discussed results of the performed tests for multicollinearity, which show a low risk. It also discussed heteroscedasticity.

Chapter 6 will discuss the results of the study.

6. Results

This Chapter presents the results of the logistic regression analysis and discusses whether they are expected and found by prior research and whether they support the hypothesis of the paper. Section 1 presents the descriptive statistics. Section 2 presents the results from the logistic regression and discuss various measures of fit of this regression and also discusses the results - whether they are expected or not with regards to theoretical prediction and empirical prior findings and whether the results support accepting or rejecting the null hypothesis. Finally, section 3 performs robustness checks - test for influential observations and statistical analysis including the outliers.

6.1 Descriptive statistics

The sample initially included 173 different companies and the sample period is 2 years. After removing of 12 outliers, the sample size is decreased to 167 companies and a total of 334 company-year observations. Table 6 provides the descriptive statistics of the variables after the removal of outliers. Panel A reports descriptive statistics for the variables for the two years of the sample period. Panel B and C report descriptive sub-sample statistics for the year before the adoption of SFAS 131 (fiscal year end 1997) and after the adoption of SFAS 131 (fiscal year end 1998) respectively. From the descriptive statistics table, it is evident that there are no missing observations and that the panel is balanced - the median of SFAS 131 is 0.5, showing that half of the companies were studied before the standard's adoption and half - after.

On average 28.7% of the companies provided forward looking information on the segment level during the 2-year sample period. Leverage (*LEV*) varies between 0 and 0.731 with a mean and median of 23% and profitability (*PROFIT*) between -1.315 and 2.295. Ownership concentration *(OC)* varies between 0.0001 and 0.483, so the sample includes companies with large ownership diffusion and companies with almost half of the shares owned by 1 shareholder. Assets-in-pace ranging from 0.030 to 0.917 includes companies with almost no fixed assets and companies, which assets are entirely fixed. Proprietary costs range from -0.886 to 1.405 so the sample includes companies, whose revenues dropped almost twice and respectively increased almost 150%. Size, which is calculated by the natural log of total assets, ranges from 6.087 to 12.783, which shows a great variety of company sizes - both relatively large and small companies are represented in the sample.

Table 6: Descriptive statistics

Panel A: Descriptive statistics for the two years of the sample period

Variable	N	Mean	Median	SD	Min	Max
SLG	334	0.287	0.000	0.453	0.000	1.000
SIZE	334	8.967	8.918	1.143	6.087	12.783
LEV	334	0.232	0.234	0.122	0.000	0.731
PROFIT	334	0.175	0.147	0.266	-1.315	2.295
SFAS131	334	0.500	0.500	0.501	0.000	1.000
PROPRIET	334	0.065	0.048	0.224	-0.886	1.405
IND	334	0.078	0.000	0.268	0.000	1.000
AIPLACE	334	0.402	0.380	0.213	0.030	0.917
OC (in %)	334	0.013	0.003	0.040	0.0001	0.483

Panel B: Descriptive statistics – mean and median for 1997

	SLG	*SIZE*	*LEV*	*PROFIT*	*SFAS131*	*PROPRIET*	*IND*	*AIPLACE*	*OC*
Mean	0.234	8.919	0.230	0.175	0.000	0.099	0.078	0.404	0.012
Median	0.000	8.851	0.235	0.149	0.000	0.060	0.000	0.395	0.003

Panel C: Descriptive statistics – mean and median for 1998

	SLG	*SIZE*	*LEV*	*PROFIT*	*SFAS131*	*PROPRIET*	*IND*	*AIPLACE*	*OC*
Mean	0.341	9.014	0.234	0.174	1.000	0.030	0.078	0.400	0.013
Median	0.000	8.972	0.223	0.142	1.000	0.030	0.000	0.374	0.003

Table 6 depicts various statistics for all variables, included in the model. The data, described in the table, is after removal of outliers. Panel A provides descriptive statistics for the variables for the two years of the sample period. Column "N" shows the number of observations. Column "SD" shows the standard deviation. Panel B and C report descriptive sub-sample statistics for the year before the adoption of SFAS 131 (fiscal year end 1997) and after the adoption of SFAS 131 (fiscal year end 1998) respectively.

When looking at panels B and C, it is interesting to note that the percentage of the companies which provided forward looking information on the segment level is 23.4% for fiscal year 1997 and 34.1% for fiscal year 1998, which shows an increase of the proportion of companies providing segment forward looking information after the adoption of SFAS 131. Performing additional analysis shows that 145 companies kept their segment level guidance policy (either disclosing or not disclosing it) the same under SFAS 131 as compared with under SFAS 14 in the previous year,

20 companies, which did not disclose segment level guidance (SLG) in 1997, did so in 1998 and 2 companies, which disclosed SLG in 1997 stopped doing so in 1998 fiscal year end. This shows that nearly 12% of the sample companies started disclosing SLG under SFAS 131. However, another notable change between the years regards proprietary costs, the mean of which decreased more than three times for a year - from 0.099 in 1997 to 0.03 in 1998. This indicates a substantial decrease in revenues in 1998. All other variables remain without substantial changes between 1997 and 1998.

6.2 Logistic regression results

The results of the multiple logistic regression for the sample of 334 companies (after outlier's removal) are presented in this subsection. As Chapter 5, Section 4 showed, the data has no serious problems with multicollinearity. Table 7 summarizes the results from the logistic regression. The regression reports the odds ratio and the odds ratio with a one standard deviation change of the independent variable, along with the coefficient, as this makes the results easier to interpret, as the estimates of the logistic regression - the coefficient and the p-value provide information only on the sign and significance of each independent variable.

6.2.1 Test of the entire model and model fit

According to Table 7, the chi-squared test of the significance of the entire model is $\chi^2 = 35.33$ and p-value = 0.0000. This indicates that the model has at least one significant predictor (Acock, 2008), and that the model is significant at a level smaller than 0.0001 significance level. The correct prediction rate is 74.85%.

The value of log likelihood as a measure of fit is -180.3449. Log likelihood increases as more regressors are added, comparable to the increase in R-squared in OLS as more regressors are added. Thus, the McFadden pseudo R-squared, a measure of the quality of fit of a logistic model and reported by Stata, is also examined. The McFadden Pseudo R-squared of the logistic model used is relatively low at 9.98%. However, it is different than the R-squared of the OLS model, an is often a small value (Acock, 2008).

Another test, the Hosmer-Lemeshow diagnostic test is used to test the fit of the model. This test performs "grouping based on the values of estimated probabilities" (Hosmer Jr & Lemeshow, 2004, p. 147). The null hypothesis under the Hosmer-Lemeshow test is that the fit is good. The

chi-squared for the test with 10 groups χ^2 (8) = 7.66 and p-value = 0.4669, shows that the null hypothesis of a good fit cannot be rejected, which leads to the supposition that the fit of the model is good.

Table 7: Determinants of Voluntary Segment Guidance Disclosures (Logit Regression)

Dependent Variable: Segment Level Guidance (SLG)

Variable	P-Value	Coefficient	SE (Coeff.)	Odds Ratio	SE (Odds)	Odds SD X	Z-Value
SIZE (+)	0.233	0.144	0.120	1.155	0.139	1.179	1.190
LEV (+)	0.099	1.854*	1.125	6.386	7.182	1.253	1.650
PROFIT (?)	0.256	0.487	0.429	1.627	0.697	1.138	1.140
SFAS131 (?)	0.107	0.426	0.264	1.530	0.404	1.238	1.610
PROPRIET (-)	0.002	-1.956***	0.643	0.141	0.091	0.645	-3.040
IND (+)	0.009	1.200***	0.458	3.321	1.522	1.380	2.620
OC (in %) (-)	0.166	-12.910	9.323	0.000	0.000	0.594	-1.380
AIPLACE (?)	0.258	0.768	0.679	2.156	1.464	1.178	1.130

N = 334; p-value = 0.0000; McFadden Pseudo R-squared = 0.0998; Log likelihood = -180.3449; χ^2 = 35.33

Table 7 presents the logistic regression results of the effect of SFAS 131 on companies' segment level guidance (SLG). The variables are defined in Appendix A. *, **, *** indicate significance of the coefficients at 10%, 5% and 1% confidence level, respectively. Robust standard errors are used. The sign of the coefficient that is expected according to theory and prior research is presented in the first column in brackets. "Odds SD X" column shows how the odds ratio changes with a one standard deviation change in the independent variable. "SE (Coeff.)" and "SE (Odds)" show the robust standard error of the coefficient and of the odds ratio respectively. The results are after removal of outliers.

6.2.2 Test of individual parameter estimates

The significance of the variable is interpreted based on the z test, calculated by Stata (the square root of Wald chi-squared test), reported in the last column of Table 7 and its corresponding p-value, reported in the second column of the same table, respectively. Apart from the z statistic, a second test is done - the likelihood-ratio chi-squared test for individual parameter estimates. If this likelihood-ratio test is different than the z statistic, it is preferred by many researchers (Acock, 2008). This test for each parameter estimate is based on "comparing two logistic models, one with the individual variable we want to test included and one without it [….] and is invariant to

nonlinear transformations" (Acock, 2008, p.346-347). As is often the case, the result from this test does not change the p-values to a large extent and the significance of the coefficients. These results can be found in Appendix G. The only substantial difference is that p-value of leverage becomes 0.113, thus the variable according to this test becomes not significant even at 10% level. *SFAS 131* is still not significant.

6.2.3 Discussion of results

SFAS 131 is not significant at 10% level, which indicates that the probability of providing segment level guidance is not different before the adoption of SFAS 131 than after it. This leads to the conclusion that the null hypothesis of the study cannot be rejected. The increase in segment level guidance under SFAS 131 from 23,4% to 34,1% was likely to be due to other factors changing, for example the large decrease in proprietary costs. This result is in opposition to Yang et al. (2013), who show that after the increase of mandatory reporting quality following the adoption of IFRS there is an increase in management forecasts. As both an increase and a decrease in the likelihood of revealing segment level guidance could have been expected, no predicted sign was assigned to this variable.

Industry is significant at 1% significance level and positively related to segment level guidance. The fact that the coefficient is positive, can be interpreted as an increased probability of providing segment level guidance when a company is in the oil and gas and mining industries. Companies in the oil and gas and mining are more regulated, so as expected, they are more likely to disclose voluntary information. As the variable is binary, the economic effect of companies being in this industry can be observed from the odds ratio, presented in Table 7. The odds ratio being equal to 3.321 can be interpreted as a 3.321 increase in the odds of providing segment level guidance, when the company is in this industry as compared to if it is in the other industries. Alternatively, it can be interpreted as 232% ([3.321-1] *100) higher odds of disclosing this guidance if the company is in the oil and gas or mining industry than if it is not. An explanation for this is that possibly the companies in this industry have employed more staff in forecasting, which leads to producing more forward looking information. Alternatively, this industry is more regulated which can also be a contributing factor (McKinnon & Dalimunthe, 2009). This finding is in line with the findings of McKinnon & Dalimunthe (2009).

The coefficient before proprietary costs is highly significant and negative. The fact that the coefficient is negative, indicates a decreased probability of providing segment level guidance, which is expected, given that the higher these costs are, the costlier it is for companies to disclose voluntary information. As this variable is not binary, the economic interpretation is more difficult and can be observed with the help from the 7th column of Table 7, which shows the odds ratio of a one standard deviation change in the independent variable (Acock, 2008). With a one standard deviation increase of proprietary costs, the odds of providing segment level guidance are 0.645, or alternatively, the odds are reduced by 35.5% ([1.00−0.645] ×100) with a one standard deviation increase of proprietary costs. This is consistent with Leuz (2003), who, using Germany as a setting, finds that companies withheld proprietary segment information before the adoption of IFRS, which made segment reporting mandatory (Leuz, 2003). Ellis et al. (2012) also find a negative relation between disclosure about customers and proprietary costs.

Leverage is not statistically significantly at 5% level in predicting segment level guidance. Though it is significant at 10% from the Wald z-test, it is not significant from the likelihood ratio test for individual estimates. Theory expected that the more leveraged a firm is, the more likely it is to disclose voluntary information due to higher agency and monitoring costs, that voluntary disclosure reduce (Fama & Miller, 1972; Jensen & Meckling, 1976). Overall, the results of prior literature with regard to leverage are mixed. This paper's results are consistent with Chow & Wong-Boren (1987), who finds no significant association between leverage and voluntary disclosure while the empirical results of Prencipe (2004) and Lan et al. (2013) show a positive association.

Size is also not significant, as opposed to the findings of McKinnon & Dalimunthe (2009), Aitken, Hooper, & Pickering (1997), Chow & Wong-Boren (1987) and Prencipe (2004), who found it to be significant and positively related to voluntary information. Ownership concentration (*OC*) is also not significant. The result is not consistent with McKinnon & Dalimunthe (2009), Prencipe (2004) and Lan, Wan and Zhang (2013), who find it to be significant at 10% level. One possible reason why ownership concentration and size are not significant contrary to the results of prior literature is that they have a correlation of -38.3%. When both correlated variables are added to the model, their distinct effects on the independent variable can be difficult to measure (Midi et al., 2010). When only size is added to the model, it is significant at 5% level, while when only ownership concentration is added, it is significant at 10% level.

Assets-in-place (*AIPLACE*) is also not significant. This result is in line with Chow & Wong-Boren (1987), who also found it to be insignificant, though Leuz (2003) find it to be positively associated with voluntary disclosure. As according to theoretical predictions, discussed in Chapter 5, the sign of the coefficient before assets-in-place can be both positive and negative, no preliminary expectations for the sign of this variable were made. Profitability is another not significant control variable. Theoretically, more profitable companies can be expected to provide more voluntary information, so that shareholders are aware of the good company performance. However, the proprietary nature of this disclosure can decrease its provision (Verrecchia, 1983). The empirical results of prior literature for profitability are mixed. While Principe (2004) also finds it to be insignificant, Leuz (2003) and Giner et al. (1997) find it to be respectively negatively and positively related to voluntary segment disclosure. As the results of prior research are mixed, the insignificant coefficient is not surprising.

6.3 Robustness checks

To check the robustness of the results, two additional tests are performed. The first test is testing for influential cases. The second is testing the model before removing outliers in order to ensure the results are robust to keeping extreme data and are not severely affected by outlier removal.

6.3.1 Influential cases

The first robustness check is to check for influential cases, to which the logistic regression is sensitive (Nurunnabi & Nasser, 2009). Influential cases are the ones, which alone or together with other cases can influence the estimates of the regression to a large extent - more so than the other cases (Nurunnabi & Nasser, 2009). Checking for influential cases is performed with the Cook's Distance test. Cook's ratio of above 1 indicate that an observation can be influential. After running the logistic regression (with robust error), none of the observations had a Cook ratio of above 1. The highest Cook's Distance value is 0.349. The mean is 0.247. For this reason, it can be concluded that the risk of individual observations from the sample of 346 companies (after outliers' removal) influencing the results more than the other observations is low.

6.3.2 Outliers

The logistic regression, conducted in Section 3 of this chapter, was performed after outliers' removal. In addition, as a robustness check, apart from performing the analysis on the data fixed from outliers, the analysis is performed with the data without removing extreme observations. Descriptive statistics of the data before outliers' removal is presented in Table 3 in Chapter 5. The results of the logistic regression before removal of outliers is presented in Appendix E. The chi-squared test of the significance of the entire model yields a $\chi^2 = 64.58$ and a corresponding p-value = 0.0000, which show that the model is significant at a level smaller than 0.0001 significance level, similar to the model after excluding outliers. The McFadden Pseudo R-squared, is 8.22%. The correct prediction rate is 74.86%, similar to the rate after the removal of outliers. Again, the data was tested for multicollinearity, which was not found to be serious. The results from pairwise Pearson correlations and VIF tests for the model, which includes outliers, can be found in Appendix D.

One of the changes when the model, which includes outliers, is that ownership concentration (*OC)* becomes significant, which is most certainly caused by the 4 outliers with a value of 1. Also, SFAS 131 becomes significant at 10%. This is most likely due to outliers given it is not robust to them. For this reason, there is no sufficient evidence for SFAS 131 to be regarded as significantly associated with voluntary segment disclosure. Also, Cook's Distance test showed values above 1, which means that influential observations are probably present and have an impact on the results. Thus, the results of the logistic regression including outliers should be treated carefully and the results of the logistic regression after the removal of outliers are regarded as more reliable.

6.4 Summary of results

Chapter 6 looked at the results of the statistics of the data, and the results of the logistic regression performed, in which segment level guidance is a dependent variable and SFAS 131 is the main independent variable. While two control variables - proprietary costs and the oil, gas and mining industry were found to be significant at 5% level, the SFAS 131 was not. For this reason, not enough evidence was found for rejecting the null hypothesis, which states that there is no effect of the improved reporting quality following the adoption of SFAS 131 on voluntary segment

disclosure. Chapter 7 will conclude and provide the limitations of the study and suggestions for further research on this topic.

7. Conclusion

7.1 Conclusions

The study uses the setting of the adoption of the standard for segment reporting SFAS 131, which replaces the highly controversial SFAS 14, in order to explore whether the improved reporting quality affected the voluntary disclosure of companies. In particular, it explores whether after the adoption of SFAS 131, companies were more or less likely to provide forward looking information on the segment level. Using a sample of 167 companies and 334 company-year observations (after outliers' removal), the results show that no significant effect between mandatory reporting quality and forward looking segment information was found. For this reason, there is not enough convincing evidence to reject the null hypothesis that voluntary (segment) disclosure and the quality of mandatory (segment) disclosure are related.

A number of control variables, some of which derived from agency theory, were added to the statistical model. Interestingly, in line with prior research results, two of the control variables are found to be significant at 5% level - oil, gas and mining industry and proprietary costs. Oil, gas and mining industry, as expected, increase the odds of providing voluntary information, while proprietary costs, as expected given the theoretical predictions and consistent with Leuz (2003), decrease them.

The study contributes to the accounting literature by exploring the underexploited topic of the interaction between mandatory reporting and voluntary disclosure. It also contributes to the segment reporting research by finding evidence that proprietary costs and oil, gas and mining industries are determinants of voluntary disclosure. Furthermore, it tests segment level guidance as a proxy for voluntary segment disclosure, following Moldovan (2015), and the results, which are relatively consistent with expectations, support this proxy as a reliable one. The study argued for the use of the adoption of SFAS 131 as a proxy for improved reporting, while also inspecting its effect on the total number of line items per segment - both required and voluntary items as a whole.

7.2 Limitations

One of the limitations of the research is that measuring voluntary segment disclosure is binary, which fails to capture subtler changes in disclosure and to differentiate between the amount or importance of the forward looking information. Potentially, the disaggregation of forecasted items can affect the informativeness and usefulness of the segment level guidance (Moldovan, 2015), so proxies, based on the forecasted line items (for example revenue, net income, expenditures) could be interesting to be further researched.

Another limitation is that due to not available data the proxy of OC is perhaps not reliable. A better proxy could be using the proportion of shares held by the 10% owners. Also, due to the time intensiveness of hand collection, the sample size is relatively small. Furthermore, not all companies equally improved their mandatory reporting. Though 62% of the sample companies increased segment line items, together with the additional disclosures required by SFAS 131 and the fact that prior research found generally an increased number of segments after the adoption of SFAS 131, the paper does not differentiate between the extent of the improvement. Some companies probably greatly improved it, others only slightly and the sample probably contains companies that did not significantly improve their mandatory reporting quality, which can decrease the ability of the model to find changes in segment level guidance after the adoption of SFAS 131 and can be one of the reasons for the insignificance of SFAS 131 for improving voluntary disclosure.

7.3 Further research

Suggestions for further research include using other proxies for voluntary segment disclosure, a larger sample and the use of other settings, not necessarily changes in segment reporting, but any changes in mandatory reporting quality, for example in the accounting for leases, to see their effects on voluntary disclosure in order to have more conclusive evidence on how mandatory reporting and voluntary disclosure interact. Furthermore, statistical models can be tested with the inclusion of various other control variables, for example agency costs, minority interest, etc. Also, the improvements in natural language processing technology can be used to create disclosure proxies, based on narrative disclosure, for example, based on the whole Management Discussion and Analysis section of the 10-K filing (Leuz & Wysocki, 2016).

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9. Appendix

Appendix A: Variable definitions

Variable names	Variable description	Method of calculation of Variable
SLG	Segment level guidance	0 in case no segment level guidance is provided, 1 if it is provided
SFAS 131	Before or after SFAS 131	0 - prior to the adoption of SFAS 131 (fiscal year end 1997), 1 - after the adoption of SFAS 131 (fiscal year end 1998)
SIZE	Firm size	Natural log of total assets (AT)
IND	Industry	Coded as 1 in case of oil and gas or mining operations, otherwise coded as 0, SIC codes 1000-1400; 2900-2912.
LEV	Leverage	Long term debt divided by total assets, (DLTT)
PROFIT	Profitability	Return on equity = Net income (NI) / common Equity (CEQ)
AIPLACE	Assets in place	Property plant and equipment Net (without depreciation) divided by total assets (AT)
PROPRIET	Proprietary costs	The current year's change in revenues = Revenues - Revenues (previous year) / Revenues (previous year) (REVT)
OC (in percentage)	Ownership concentration (Average percentage of shares outstanding, owned by one shareholder)	[(Total number of shares outstanding (CSHO)[6] / the total number of shareholders (CSHR)) / Total number of shares outstanding CSHO] *100

This table displays the definitions and calculation of the variables discussed in this paper. All variables, except from SLG, which was hand collected, were obtained from Compustat. In brackets are the name of the variables as available and collected from Compustat.

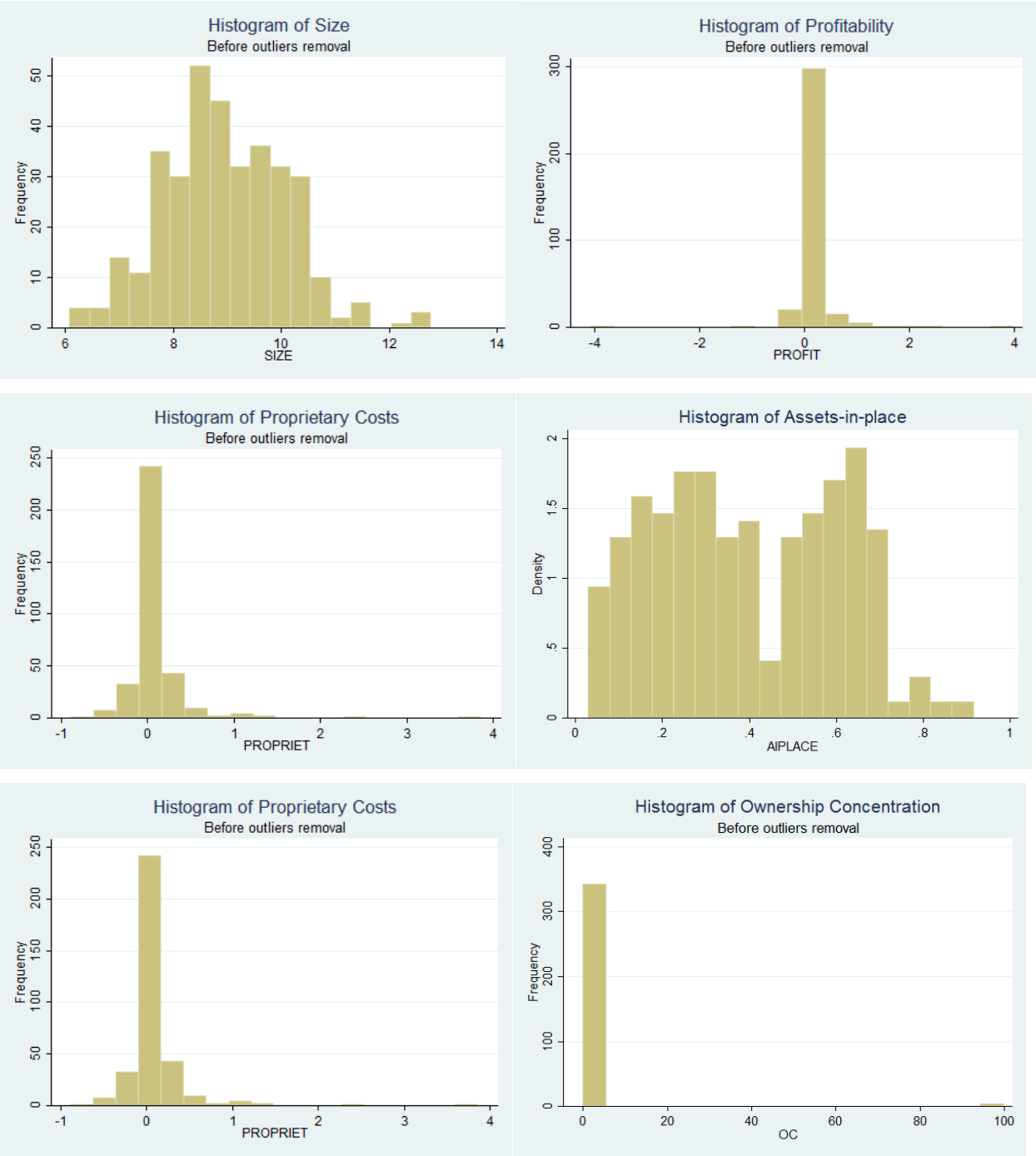
[6] Please note that for OC calculation the variables obtained from Compustat were not in the same scale. In order to fix this, the value of shares outstanding (CSHO) was multiplied by 1000000 and number of shareholders (CSHR) by 1000 in order to be in the same scale.

Appendix B: Sample collection procedure

Description	Companies
Beginning companies	500
Firms with no CIK number (not present in SEC EDGAR)	(11)
Duplicate companies (merged)	(4)
Firms that do not have 10-K filings for reporting periods ending December 1997 and December 1998	(18)
Financial institutions, real estate companies and insurance companies (SIC	(152)
Firms with different fiscal year end	(105)
Early adopters	(6)
Undiversified companies - companies that do not report segments for both	(27)
Firms with significant changes to operations	(4)
Final different companies in the sample	173
Outliers	(6)
Final different companies in the sample after outliers	167
Final sample company-year observations (2 years' sample period)	334

This table shows the sample formation process. The process started from the 500 companies included in the Fortune listing for 1997. Then, companies are removed for various reasons. The numbers in brackets indicated subtracted companies from the sample. The final sample before outlier removal is 173 companies and 346 company-year observations. After the removal of 6 outlier companies, it is 167 companies and 334 company-year observations.

Appendix C: Histograms



Appendix C shows the frequency histograms of the observations of the non-binary independent variables included in the logistic model before the removal of outliers. These histograms are inspected in order to spot outliers (extreme observations) in the data.

Appendix D: Collinearity tests before outliers' removal

Table 1: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) SLG	1.000								
(2) SFAS131	0.116*	1.000							
(3) SIZE	0.122*	0.046	1.000						
(4) PROFIT	0.005	0.039	0.049	1.000					
(5) IND	0.210*	0.000	0.135*	-0.057	1.000				
(6) LEV	0.135*	0.042	0.056	0.043	-0.03	1.000			
(7) OD	-0.068	0.000	-0.066	-0.079	-0.031	-0.177*	1.000		
(8) AIPLACE	0.167*	-0.011	0.154*	-0.164*	0.283*	0.085	-0.045	1.000	
(9) PROPRIET	-0.102	-0.085	0.071	-0.057	-0.0845	0.063	0.046	-0.009	1.000

This tables shows Pearson correlation between all variables, included in the logistic model. The higher the value, the higher the correlation between the variables. A value of 1.000 means the highest and 0.000 the lowest correlation possible. * shows significance at 0.05 significance level for testing whether the correlation is different than zero. The correlations results are for the data before the removal of outliers.

Appendix D: Collinearity tests before outliers' removal (continued)

Table 2: VIF table

Variable	VIF
AIPLACE	1.15
IND	1.11
SIZE	1.06
LEV	1.05
PROFIT	1.05
OD	1.05
PROPRIET	1.03
SFAS131	1.01

This table displays the variance inflation factor (VIF) test for multicollinearity before removal of outliers. As VIF values are close to 1, they are considered to show low levels of multicollinearity. Multicollinearity issues arise at values above 10 (Acock, 2008; Rawlings et al., 2001). The VIF results are for the data before the removal of outliers.

Appendix E: Determinants of Voluntary Segment Guidance Disclosures (Logit Regression) before removal of outliers

	Dependent Variable: Segment Level Guidance (SLG)						
Variable	P-Value	Coefficient	SE (Coeff.)	Odds Ratio	SE (Odds)	Odds SD X	Z-Value
SIZE (+)	0.082	0.190*	0.109	1.209	0.132	1.179	1.740
LEV (+)	0.048	2.154**	1.088	8.623	9.380	1.253	1.980
PROFIT (?)	0.529	0.131	0.208	1.140	0.238	1.138	0.630
SFAS131 (?)	0.061	0.477*	0.254	1.611	0.410	1.238	1.870
PROPRIET (-)	0.252	-0.856	0.747	0.425	0.317	0.645	-1.150
IND (+)	0.004	1.260***	0.441	3.526	1.554	1.380	2.860
OC (-)	0.000	-0.061***	0.012	0.941	0.012	0.594	-4.940
AIPLACE (?)	0.205	0.792	0.625	2.209	1.380	1.178	1.270

N= 346; p-value = 0.0000; Pseudo R-squared = 0.082; Log likelihood = -189.263; $\chi^2 = 64.58$

This table presents the logistic regression results of the effect of SFAS 131 on the companies' segment level guidance (SLG) before removal of outliers. All variables are defined in Appendix A.

*, **, *** indicate significance of the coefficients at 10%, 5% and 1% confidence level, respectively. Robust standard errors are used. "Odds SD X" column shows how the odds ratio changes with a one standard deviation change in the independent variable. "SE (Coeff)" and "SE (Odds)" show the robust standard error of the coefficient and of the odds ratio respectively. The results are before removal of outliers.

Appendix F: Distribution of sample by industry

Industry	Companies	Percentage
Food	8	4.79
Mining and Minerals	1	0.60
Oil and Petroleum Products	12	7.19
Textiles, Apparel & Footwear	1	0.60
Consumer Durables	3	1.80
Chemicals	13	7.78
Drugs, Soap, Perfumes, Tobacco	11	6.59
Construction and Construction Materials	7	4.19
Steel Works Etc.	5	2.99
Machinery and Business Equipment	18	10.78
Automobiles	5	2.99
Transportation	11	6.59
Utilities	20	11.98
Retail Stores	6	3.59
Other	46	27.54
Total	167	100

This table presents the distribution of companies in the sample by industry after outliers' removal. The industry classification by Fama and French (1997) is used. It is a reclassification based on the companies' SIC codes. Column 2 shows the number of companies per industry. Column 3 indicates the percentage of total companies that are in a specific industry.

Appendix G: Results from Likelihood Ratio chi-squared test for individual parameter estimates

	Chi-squared	P-value
SIZE	1.11	0.292
LEV	2.51	0.113
PROFIT	1.06	0.304
SFAS 131	2.63	0.105
PROPRIET	8.99	0.003***
IND	6.510	0.011***
OC	1.78	0.182
AIPLACE	1.17	0.279

This table show the results of likelihood ratio tests for individual parameter estimates of the logistic regression, performed after removing of outliers. *, **, *** indicate significance of the coefficients at 10%, 5% and 1% confidence level, respectively. The p values are not substantially different than those of z-test and its p-values of the logistic regression, which is common.

Appendix H: Mandatory segment line items under SFAS 131

- profit or loss and identifiable assets

"§ 27. a. Revenues from external customers

b. Revenues from transactions with other operating segments of the same enterprise

c. Interest revenue

d. Interest expense

e. Depreciation, depletion, and amortization expense

f. Unusual items as described in paragraph 26 of APB Opinion No. 30, *Reporting the Results of Operations—Reporting the Effects of Disposal of a Segment of a Business, and Extraordinary, Unusual and Infrequently Occurring Events and Transactions*

g. Equity in the net income of investees accounted for by the equity method

h. Income tax expense or benefit

i. Extraordinary items

j. Significant noncash items other than depreciation, depletion, and amortization expense.

§ 28 a. The amount of investment in equity method investees

b. Total expenditures for additions to long-lived assets other than financial instruments, long-term customer relationships of a financial institution, mortgage and other servicing rights, deferred policy acquisition costs, and deferred tax assets."

Source: Citation from Statement of Financial Accounting Standards No. 131, § 27 and § 28, 1997, p.11. This figure summarizes the required segment line items under SFAS 131. SFAS 131 requires the same line items as SFAS 14, but with the addition of several more items - income tax and interest expense, interest revenue, and significant noncash items. In contrast to SFAS 14, it unconditionally requires only two items - profit or loss and identifiable assets. However, it additionally requires the items a-j from § 27 of SFAS 131, but only if they are part of the segment's final result, which is reviewed by the chief operating decision maker[7] (CODM) and items from § 28 a-b but only if they are part of the segment assets, which are reviewed by the CODM.

[7] The chief operating decision maker is a person or a group of people, who are responsible for allocating resources between segments and assessing their performance (Statement of Financial Accounting Standards No. 131, 1997).