The Interplay between Segment Disclosure Quantity and Quality

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Abstract

This paper investigates managers' choices with respect to both disclosure quantity and quality, and the usefulness of these two characteristics for financial analysts. Focusing on segment disclosures under the management approach, we measure quantity as the number of segment-level line items and quality as the cross-segment variation in profitability, and argue that more managerial discretion can be exercised over quality than over quantity. We hypothesize and find that managers solve proprietary concerns either by deviating from the suggested line-item disclosure in the standard, or, if following standard guidance, by decreasing segment reporting quality. Moreover, financial analysts do not always understand the quality of segment disclosures suggesting that a business-model type of standard creates difficulties even for sophisticated users. Our results inform standard setters as they start working on a disclosure framework and as they seem to consider the business model approach to financial reporting.

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The Interplay between Segment Disclosure Quality and Quantity

1. Introduction

This paper integrates two disclosure characteristics – quality and quantity – to contribute to our understanding of managers' choices regarding corporate financial disclosures and of financial analysts' ability to benefit from both the quantity and the quality of information disclosed. Focusing on multiple disclosure characteristics at a time brings us closer to understanding managers' overall disclosure strategy (Beyer et al. 2010).

Disclosure quality and quantity are currently on standard setters and regulators' radars (Barker et al. 2013) as investors and financial analysts denounce a perceived increase in the number and length of financial disclosures without an increase in corresponding quality and usefulness for users (CFA Institute 2007). From this point of view, increased disclosure quantity might appear as a smokescreen for low disclosure quality. As a result, national and European-level regulators have initiated public debates and issued discussion papers in an effort to get the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) to bring the length of financial reporting disclosures under control and to increase their quality (EFRAG 2012; Financial Reporting Council 2012). In response, the IASB has added a disclosure framework project to its agenda to complement the Conceptual Framework.[1]

Segment reporting under the management approach in IFRS 8 *Operating Segments* provides a setting where mandatory and voluntary disclosure with a strong discretionary component interplay which allows us (1) to measure disclosure quantity and quality as distinct dimensions, thus avoiding a mechanical correlation induced by the measurement process (Botosan 2004), and (2) to make new predictions about managers' choices with

[1] As of May 15th, 2014, the IASB medium-term agenda includes a standards-level review of disclosure project and a disclosure framework project.

respect to disclosure quality and quantity based on their relative discretionary appeal. The question of how disclosure quality is best defined and measured and its relation with disclosure level is yet to be answered (Beyer et al. 2010). Oftentimes, disclosure quality is either equated with or seen as a function of disclosure level (e.g., Lambert et al. 2007; Francis et al. 2008; Shalev 2009). Even when trying to capture other dimensions of disclosure that could be deemed "disclosure quality," accounting researchers still end up counting items (Beretta & Bozzolan 2004; Bozzolan et al. 2009; Botosan 2004). Therefore, disclosure quality appears positively related to quantity either as a consequence of the measurement process or as an implicit assumption. We do not per se disagree with the view that quantity could be regarded as a component of overall disclosure quality, but argue that in our particular setting we can disentangle between segment disclosure quality by measuring it as the quality of operating segment aggregation without relying on the number of segments disclosed or on any item or word count (Botosan 2004). Our interest is precisely to distinguish between the two in order to understand what role they serve, separately and together, from the manager's perspective, and how they impact analysts' forecasts.

There are two main decisions related to segment reporting that managers make: what operating segments to report, and what and how many segment-level line items to disclose. Under the "management approach" in IFRS 8 the segment reporting note to financial statements should reflect – both in terms of reported segments and in terms of line items – the internal organization of the company and the view management has on it.[2] The standard defines an operating segment as a regularly reviewed business component of an entity and allows the aggregation of economically similar components into reportable operating segments. The way in which IFRS 8 sets up the segment aggregation rules leads to "clusters" of similar operating segments that are very different from all the other operating segments of

[2] IFRS 8 and SFAS 131 are converged, so IFRS 8 requirements are the same as those of its US GAAP counterpart. Since we use a sample of European firms reporting under IFRS, we will only refer to IFRS 8 throughout the paper.

the company. Properly applied, the aggregation criteria should lead to high variability in segment-level profitability (Ettredge et al. 2006). In order to measure the quality of operating segment aggregation, we follow Ettredge et al. (2006) who rely on the intention of the standard to "dissuade multiple segment firms from aggregating operating segments with different economic characteristics as indicated by different profit margins" in order to build a measure of diversity in operating segment results. Therefore, the quality dimension of segment reporting is given by how faithfully representative operating segment aggregation is.

The quantity dimension of segment reporting is the number of segment-level line items disclosed in the note. According to the standard, disclosing a measure of profit or loss at the segment level is mandatory. All other suggested line items mentioned in the standard should be disclosed only if the management reviews them regularly in the course of the entity's normal activity. Conditioning line-item disclosure in this way lends it a voluntary character and gives rise to three possible groups of firms – those that stick strictly to the standard's suggestions and disclose more or less the same number of line items as mentioned in the standard (*Box-tickers*), those that disclose fewer line items than mentioned in the standard (*Under-disclosers*), and those that disclose more line items than suggested (*Over-disclosers*).

We address our research questions a sample of 270 multi-segment European firms in the STOXX Europe 600 index at the end of 2009 that report a non-geographical main segmentation. The mandatory switch to IFRS 8 in 2009 allows firms to re-evaluate their segment disclosures and potentially break from existing disclosure habits, which makes the investigation of managers' disclosure decisions at this point in time all the more meaningful. We first investigate the determinants of the choice to be in the *Under-disclosers* and *Over-disclosers* group, compared to the benchmark (i.e., middle) *Box-tickers* group. Considering the "visibility" of segment reporting quantity, we hypothesize that *Under-disclosers* have

high proprietary and agency costs that lead them to provide fewer segment line-items, and that *Over-disclosers* have strong incentives to be transparent. Results from multinomial logistic models provide some support for these hypotheses. Specifically, we find that companies with proprietary concerns related to increased market concentration and potential entry are more likely to disclose fewer segment line-items. Management ownership that reflects entrenchment is also positively associated with the likelihood to be in the *Under-disclosers* group. Companies with an overall high disclosure policy proxied by the length of the annual report are more likely to disclose more line-items than suggested by the standard and to be part of the *Over-disclosers* group. Similar multilogit analyses for the choice between high/low/average segment reporting quality reveal financial performance as the main determinant. Companies with overall good financial performance also provide high quality segment disclosures, while those with poor performance are more likely to hide bad decisions by showing a "smooth" pattern of segment profitability.

When assumed independent, compared to being a *Box-ticker*, being in the *Under-disclosers* group is associated with lower earnings forecast accuracy, but being in the *Over-disclosers* group also leads to lower forecast accuracy. This result could be explained either by a "disclosure overload" phenomenon where too much information is detrimental to financial analysts' information processing capabilities, or by analysts interpreting the extra information as a smokescreen for low disclosure quality and discounting it too much. In a model including the groups based on segment reporting quality as variables of interest, the low quality companies (*LowQl*) have lower forecast accuracy compared to the average quality ones *(AvgQl)*, while analysts following high quality (*HighQl*) companies are able to forecast earnings more accurately. Since the two characteristics are not independent, we test their joint effect on financial analysts' earnings forecast error by interacting the quality and quantity groups. We eliminate from this analysis the group combinations for which we have

no prior on what the predicted sign of the relation should be (i.e., the extreme groups on the second diagonal in a matrix from high to low quality and quantity). Compared to the *LowQl & Under-disclosers* benchmark group, all other group combinations lead to higher forecast accuracy.

The companies that disclose the suggested amount of segment line items may still face proprietary and agency concerns, but, unlike *Under-disclosers,* may choose to solve them differently. Our expectation is based on the assumption that the decision on disclosure quantity is taken before the one on quality. The importance of providing consistent voluntary disclosure in time (Graham et al. 2005; Einhorn & Ziv 2008; Tang 2014) generates a different level of managerial discretion over quantity compared to quality. Discretion can presumably be exercised over the quality of operating segment aggregation from one year to the next without any "visible" changes in segmentation (Lail et al. 2013; You 2014). By restricting the sample to the *Box-tickers* group and modeling the determinants of quality, we find that proprietary costs from product market competition and from innovation activities are associated with lower quality of operating segments disclosed. A test of the earnings forecast accuracy for the subsample of *Box-tickers* reveals that analysts do not distinguish high from average quality, although they are able to distinguish low from average quality.

This paper contributes to the literature on disclosure characteristics, more specifically to the literature on segment information, and to current debates about disclosure quantity and quality involving users and standard setters. We contribute to the literature by taking a step in the direction of understanding the holistic nature of managers' disclosure strategies. As suggested by Beyer et al. (2010), by focusing on multiple disclosure characteristics at a time we contribute to the literature with new results on the choice, and effects, of disclosure quality when disclosure quantity has been chosen previously. Our results also inform users and standard setters. We show that proprietary concerns are solved in different ways – either

by not following the standard's suggestions for disclosure quantity, or, if following what the standard suggests, by applying discretion in operating segment aggregation. Moreover, financial analysts do not always understand the quality of segment disclosures which implies that a business-model type of standard creates difficulties even for sophisticated users in interpreting information.

The following section provides a discussion of the institutional background, prior research, and hypotheses development. Section 3 describes the variable measurement and research design. Section 4 discusses the empirical findings and section 5 concludes.

2. Prior research and hypotheses development

2.1 Institutional background

Once a company diversifies its operations or geographic spread, disaggregated segment disclosures contribute to investors' assessment of the various sources of the consolidated accounting numbers. A firm reports its segments in the notes to financial statements, regulated by the pertaining financial reporting standard (e.g., SFAS 131 under US GAAP; IFRS 8 under IFRS). Which segments to disclose and what information to give for each segment are the main aspects that managers have to decide upon related to segment reporting. Based on the requirements in IFRS 8 and on prior literature, we distinguish between the quality and quantity dimensions of segment disclosures: the quality of operating segment aggregation into reportable segments, and the number of line items disclosed per segment in the note to financial statements.

The overarching principle of the standard is the "management approach" to segment reporting which aligns external segment reporting with firms' internal organization for operating decision purposes. Managers should disclose the internal structure and the measures they use internally to evaluate performance and allocate resources. In other words,

segment reporting should reflect the way in which the company is organized and functions and provide users with all the information the management considers relevant for investors' decision-making purposes. Although the standard goes on to detail a number of aspects related to segment reporting, the guiding principle can be summarized as "what the management sees and is useful for investors."

Operating segments are defined as components of an enterprise that (1) engage in business activities earning revenues and incurring expenses, (2) are regularly reviewed by management, and (3) for which discrete financial information is available (IASB 2006). The basis of segmentation could be products and services, geographic area, legal entity, customer type, or another basis as long as it is consistent with the internal structure of the firm. Operating segments can be aggregated if they have similar economic characteristics and are similar in terms of products, customers, distribution, production, and regulation applicable (IASB 2006). By aligning segment disclosures to the internal organization of the company (IASB 2006; FASB 1997), the management approach gives managers a lot of freedom in their segment reporting (Nichols et al. 2012). Managers' discretion in "cropping" segments for reporting purposes has long been recognized in the literature (e.g., Harris 1998; Berger & Hann 2003; Berger & Hann 2007). The post-implementation reviews conducted by the IASB and the FASB confirm that the quality of operating segments aggregation remains a major concern for users (FAF 2013; IASB 2013; Moldovan 2014).

The way in which IFRS 8 sets up the segment aggregation rules leads to "clusters" of similar operating segments that are very different from all the other operating segments that the company has, and which allow to discriminate between the different businesses in which the company is involved (Ettredge et al. 2006; Nichols et al. 2013). Properly applied, the aggregation criteria would lead to high variability in segment-level profitability, operating margins, and risk. Therefore, we view the quality of operating segment aggregation as the

quality of segment disclosures and, similar to the measure developed in (Ettredge et al. 2006), use the cross-segment variability in return on assets as proxy.[3]

Segment reporting quantity is the number of accounting items disclosed in the segment note. The standard mandates the disclosure of a profit or loss measure at segment level and lists a number of other line items that should be disclosed if the management reviews them regularly.[4] Conditioning on whether the management reviews these items introduces a voluntary component to segment line-item disclosure. Some companies could use this condition as a pretext to avoid reporting certain segment-level line items. Other companies could strictly follow the standard and disclose only the line items suggested, although perhaps the management reviews more items, while others could disclose many other line items. All of these companies are technically within the requirements of the standard.[5]

2.2 Prior research on disclosure characteristics

Just like earnings quality (Dechow et al. 2010), disclosure is also not a uni-dimensional concept, but rather can be characterized from different perspectives that could range from how much information is provided to the location inside a document, to the

[3] Besides the aggregation criteria, the standard also contains a set of "three plus one" quantitative thresholds as indicative benchmark for when an operating segment should be disclosed: 10% of revenue, profit, and assets of the identified operating segments and 75% of the entity's revenue. These quantitative criteria are meant to help managers strike a balance between the importance and granularity of the reported segments, but are still surpassed by what the management considers to be useful information for investors.

[4] Paragraph 8.23 suggests the following line items: assets, liabilities, external revenues, internal revenues, interest revenue, interest expense (or net interest), depreciation and amortization, other material items of income and expense, interest in profit or loss of associates and joint ventures accounted for using the equity method, income tax expense or income, material non-cash items other than depreciation and amortization. Paragraph 8.24 adds the amount of investment in associates, and the amounts of additions to non-current assets other than financial instruments, deferred tax assets, post-employment benefit assets, and rights arising under insurance contracts.

[5] For example, although IFRS 8.21 lists segment liabilities, many companies do not disclose it claiming that it is not a measure reviewed at the segment level and ESMA agrees with this interpretation (ESMA 2012). The initial version of the standard included segment assets as a required item alongside segment profit or loss. An amendment to the standard adopted in 2010 conditioned this requirement based on whether the management regularly reviews this item and allowed early adoption. When constructing our sample, we lose many companies precisely because they chose to early adopt this amendment and not disclose segment assets.

timing and choice of disclosure venue.[6] Although managers set up a holistic disclosure policy, existing literature tends to examine one disclosure characteristic at a time (Beyer et al. 2010). There is a fairly large body of research on the quantity of information that companies provide in general in the annual report (Botosan 1997; Hope 2003b) or specific for certain disclosures such as accounting policies (Hope 2003a) and risk disclosure (Beretta & Bozzolan 2004; Bozzolan et al. 2009), the voluntary nature of disclosure (e.g., Chen et al. 2002; Zechman 2010; Blacconiere et al. 2011), and even non-disclosure (Depoers & Jeanjean 2012; Hollander et al. 2010). Disclosure frequency has been examined in relation to equity issuance (Lang & Lundholm 2000) and cost of equity capital (Botosan & Plumlee 2002). A few papers examine the choice of venue for certain disclosures, e.g., Bamber & Cheon (1998) for management forecasts, Myers et al. (2013) for restatement announcements, Cormier et al. (2009) and Cormier et al. (2010) for using websites to communicate corporate performance and business model. The impression management literature examines the location of certain pieces of information usually in press releases (Guillamon-Saorin et al. 2012; Merkl-Davies & Brennan 2011).

As a specific type of voluntary disclosure, management guidance has received a lot of attention.[7] The literature has looked at the its frequency and precision (e.g., Bamber et al. 2010; Bhojraj et al. 2012), or further disaggregation (Lansford et al. 2013), and oftentimes has used the disclosure of management guidance as proxy for overall disclosure quality (e.g., Li 2010; Balakrishnan et al. 2012). For the time periods when they were available, AIMR rankings were used in the literature as scores for disclosure quality (Lang & Lundholm 1993; Lang & Lundholm 1996).[8] Another stream of literature examines the language for

[6] We use the term "disclosure" to mean all financial communication provided by the management of the company in the notes to financial statements and outside the financial statements (Mayew 2012). Compared to the accounting literature, standard setters restrict this term to information provided in the notes to financial statements (Bratten et al. 2013).
[7] Database availability has contributed to the popularity of management forecasts in the accounting literature.
[8] AIMR rankings were discontinued in 1997.

characteristics such as readability (e.g., Li 2008; 2010), tone (e.g., Davis & Tama-Sweet 2012), and repetitiveness (Li 2013) to infer disclosure quality.

The question of how disclosure quality is best defined and measured and its relation with disclosure level is yet to be answered (Beyer et al. 2010). Oftentimes, disclosure quality is either equated with or seen as a function of disclosure level (e.g., Lambert et al. 2007; Francis et al. 2008; Shalev 2009). Botosan (2004) remarks that even when trying to capture other dimensions of disclosure that could be deemed "disclosure quality," accounting researchers still end up counting items. In light of prior research on disclosure characteristics and the discussion above, our aim is to take one step towards a holistic understanding of managers' financial reporting and disclosure choices by integrating multiple characteristics. In order to do this, we specifically focus on the quantity and quality of segment reporting where we can distinctly identify and measure them.

2.3 Prior research on segment disclosure

Measures of segment reporting quality and quantity

The distinction between segment reporting quality and quantity is somewhat blurred in the literature. A few papers construct measures to assess segment disaggregation, while others infer quality from the number of segment-level line items. Givoly et al. (1999) assess the measurement error of segment reporting under SFAS 14 as the difference between the correlation in the performance of the segments with the industry and the average correlation of the performance of single line-of-business (LOB) firms in the industry.[9] Bens & Monahan (2004), Berger & Hann (2007), and Franco et al. (2013) use the ratio of the number of reported segments to the number of business units in which a firm operates (i.e., two-digit SIC codes, industry segments according to the Lexis/Nexis Directory of Corporate

[9] For a cross-section of industries, if the segment-industry correlation is systematically lower than the correlation of single-LOB firms with the industry, then, on average, segment reporting has more measurement error than that of single-LOB firm reports.

Affiliations database) to capture information disaggregation. These measures rely heavily on the assumption that reported segments reflect the industry lines in which the company operates, as was the case under IAS 14 and SFAS 14.

In order to assess the quality of segment disaggregation under the management approach, Ettredge et al. (2006) design a metric to capture the cross-segment variability of reported segment profits which represents diversity in operating results as the largest return on sales (ROS) minus the smallest ROS for the segments of the same company.[10] They find that the cross-segment variability of reported segment profits increased after SFAS 131, consistent with the conjecture that, on average, firms applied the aggregation criteria as intended. Lail et al. (2013) and You (2014) use similar measures. We also opt for an adjusted version of this measure.

Some papers such as Herrmann & Thomas (1996) and Franco et al. (2013) infer segment reporting quality from the number of financial statement items disclosed per segment. Similarly, Prencipe (2004) creates an index based on the items required by IAS 14.[11] Blanco et al. (2014) develop a voluntary segment disclosure index based on the degree of compliance with SFAS 131 regarding the number of items of information provided by each firm for its reportable segments, both operational and geographic.

The adoption of SFAS 131 and IFRS has led, on average, to an increase in the number of segments reported (e.g., Herrmann & Thomas 2000; Berger & Hann 2003; Nichols et al. 2012; Bugeja et al. 2014; Leung & Verriest 2014). Relying on these findings, papers investigating the change in accounting standards infer their quality from the standard itself, using an indicator variable for the new, "better" standard (e.g., Behn et al. 2002b; Hope & Thomas 2008; Ettredge et al. 2005; Park & Shin 2009; Lobo et al. 1998). The number of line

[10] They control for inherent cross-segment profit variability using the profitability of single-segment firms in the same industries as the multi-segment firm's segments.

[11] External revenue, inter-segment revenue, operating result, assets, liabilities, capital expenditure, depreciation and amortization, other non-cash expenses, basis for inter-segment pricing.

items, however, has decreased under the management approach (Bugeja et al. 2014; Crawford et al. 2012; Leung & Verriest 2014; Nichols et al. 2012), which raises the issue of overall informativeness of segment disclosure under the new standards and the need to understand the interplay between these two dimensions.

Determinants of segment information

The two main reasons put forth for aggregating segment information are proprietary considerations and agency problems. Hayes & Lundholm (1996) show analytically that the decision involves trading off the benefits of informing the capital market about firm value against the cost of disclosing information that could potentially aid rivals and harm the firm.[12] Disentangling the two determinants has been the subject of most research on segment reporting.[13]

Some of the empirical results support the hypothesis that managers aggregate segment information to protect profits in less competitive industries. Under SFAS 14, operations in less competitive industries were less likely to be reported as industry segments (Harris 1998).[14] Additionally, firms that were reporting one segment under SFAS 14 and initiated multi-segment disclosure under SFAS 131 were hiding profitable segments operating in less competitive industries than their primary operations (Botosan & Stanford 2005). Firms in industries with high concentration ratios or that were dependent on a few major customers engaged in more aggregation of segments under SFAS 14 (Ettredge et al. 2002). Nichols & Street (2007) find a negative relation between disclosure of a business segment under IAS 14R and company ROA in excess of the industry average, supporting competitive harm arguments for aggregation and/or nondisclosure. Managers want to hide segment profitability

[12] In equilibrium, they find that different activities are reported as separate segments when results are sufficiently similar, but activities are aggregated into one segment when results are sufficiently different.
[13] Nichols et al. (2013) provide a recent detailed review of the segment reporting literature.
[14] The industry competition measures used are the four-firm concentration ratio and the speed of abnormal profit adjustment.

(Berger & Hann 2007) and segment earnings growth (Wang et al. 2011).[15] Ettredge et al. (2006) find, however, a continuing but decreasing effect of proprietary costs on segment profitability disclosures post-SFAS 131.

It is not clear, however, whether the source of hiding segment profitability is proprietary costs or agency costs. The agency cost hypothesis posits that segment-level information and results are withheld due to conflict of interest between managers and shareholders (Bens et al. 2011). Managers could be hiding the low profitability of some operations through aggregation in an attempt to mask moral hazard problems. Moreover, they could also be hiding the true level of diversification of the company. Prior literature shows that diversified firms' shares trade at a discount compared to single-segment firms (Berger & Ofek 1995) and that this discount is due, at least partly, to agency problems (Berger & Ofek 1999).

The literature provides mixed evidence with respect to the agency cost motives. On the one hand, Botosan & Stanford (2005) find no evidence that firms which initiated multi-segment disclosure under SFAS 131 were aggregating information under the old standard to mask poor performance. On the other hand, Berger & Hann (2007) partition their sample into firms more likely to have agency cost issues, and the others likely to have high proprietary costs and their results are consistent with the agency cost motive. Bens et al. (2011) use confidential US Census data to distinguish between the proprietary and agency cost hypotheses but they cannot draw a clear-cut conclusion. Results show that the probability a pseudo-segment is disclosed separately relates negatively to inefficient transfers the pseudo-segment receives from the other segments of the firm, and positively to the speed of abnormal profit adjustment exhibited by firms in the segment's industry. Additionally, if the pseudo-

[15] The competitive harm argument can be made for geographic area disclosures, as well. Country-specific disclosures represent the highest possible level of disaggregation of a firm's foreign revenues and may be viewed as sensitive if, for example, a large percentage of foreign revenues come from a country in which major competitors are not currently located (Tsakumis et al. 2006).

segments of a single-segment firm operate in industries with high concentration of private firms then the firm is less likely to identify them separately.

As for other determinants, Ettredge et al. (2002) find that larger and more complex firms engaged in more aggregation of segments under SFAS 14. Ettredge et al. (2006) sample specifically large, complex firms that reported multiple segments under both SFAS 14 and 131 and find that capital market disclosure incentives play a significant role in segment reporting post-SFAS 131. Similarly, firms that experience declines in liquidity and increases in information asymmetry (i.e., analyst forecast dispersion) tend to increase the frequency of their segment reporting (Botosan & Harris 2000). Moreover, the frequency with which a company's peers disclose segment reporting influences the frequency with which the company itself reports (Botosan & Harris 2000).

Segment reporting and financial analysts' information environment

Segment earnings have predictive power for future consolidated earnings (Kinney Jr. 1971; Collins 1976) and segment revenue is useful for investors' evaluation of firm' growth prospects incremental to consolidated data (Tse 1989). Since analysts are the main advocates for more disaggregated segment information, their reactions to segment disclosures have long been under scrutiny. Research in this area aims to understand analysts' judgment-making with respect to segment information (e.g., Maines et al. 1997 - experiment; Seese & Doupnik 2003 - survey) and to assess the effects of segment data on analysts' forecast characteristics. Early evidence points to reduced forecast dispersion following release of first-time mandated segment disclosures (Baldwin 1984; Swaminathan 1991) and to more accurate forecasts following disclosure of SFAS 14 segment information, be it LOB (Lobo et al. 1998), or geographical (Balakrishnan et al. 1990).

The changes in segment reporting that followed the implementation of SFAS 131 in the US have improved analysts' forecast accuracy (e.g., Venkataraman 2001; Berger & Hann 2003) but had no effect on analysts' idiosyncratic information (Venkataraman 2001). Reporting more segments under SFAS 131 improves forecast consensus (Venkataraman 2001; Berger & Hann 2003), but reliance on publicly available segment information may in fact increase the uncertainty in analysts' forecasts (Botosan & Stanford 2005). Post-SFAS 131 segment reporting has more predictive ability for consolidated earnings (Behn et al. 2002), has improved geographic segment disclosure that reduced the mispricing of foreign earnings (Hope et al. 2008), and for companies that no longer disclose geographic segment earnings after SFAS 131 analysts' forecasting abilities are not impaired (Hope et al. 2006).

2.4 Hypotheses development

The business-model orientation of the standard has turned segment reporting into a type of disclosure that is mandated but has strong discretionary and voluntary components. Managers decide on how much information to give at segment level, i.e., segment reporting quantity, and what operating segments to disclose, i.e., segment reporting quality. We investigate what influences managers' choice of quantity and quality and how these choices influence individual financial analysts' forecast accuracy. In order to build our expectations, we draw from the determinants identified in the prior literature discussed above and from practical aspects related to reading and interpreting the segment note.

Determinants of the likelihood to deviate from line-item standard suggestions

Apart from mandating a measure of profit and loss, the standard suggests certain line items to be disclosed in the segment note if the manager regularly reviews these items in the normal course of his activity. Therefore, to a large extent, the segment line items are provided

on a voluntary basis but for which there exists some regulatory guidance. We aim to understand what drives some companies to "deviate" and disclose fewer or more line items while others more strictly stick to the guidance in the standard.

The quantity of information provided in the segment note is a visible characteristic of segment disclosure. It is rather straightforward to read a segment note, and assess the number of line items disclosed and how this compares to what is suggested in the standard. Therefore, users can easily interpret this as an indication of how much information management is willing to give. If managers understand this interpretation, want to decrease information asymmetry and be perceived as transparent, then they will provide at least the line-item information suggested in the standard. Deciding to disclose fewer segment line items may then be the result of high proprietary and agency costs that exceed any capital markets benefits attached to providing more information (Verrecchia 1983).

H1a. Compared to box-tickers, under-disclosers of segment reporting quantity have high proprietary and agency costs.

The other group of companies that emerges based on managers' practices relative to segment reporting quantity is that of "over-disclosers" – the companies that disclose more line items than suggested by the standard. These companies most likely have strong incentives to be transparent and provide a lot of information to the capital markets. Such incentives could result from different sources. Having a high quality auditor that pays a lot of attention to the way in which companies disclose information in the notes could result in more information being disclosed. Prior literature has shown that clients of large audit firms are more likely to disclose more (Hope 2003a), leading Lang et al. (2012) to interpret auditor quality as a proxy for disclosure transparency. Therefore, we expect firms audited by Big 4 auditors to more diligently follow IFRS 8 specifications in terms of the line items to be disclosed per segment. Cross-listing in the US with a regulatory regime generally interpreted

as being of high quality creates a bonding effect (Coffee 2002) and could lead companies to provide more disclosure in an effort to increase their perceived transparency. Firms with equity financing needs have incentives to disclose more in order to convey their future prospects to investors (Healy & Palepu 1993) so that their current shareholders are not negatively affected (Myers & Majluf 1984). If a high disclosure level makes financing cheaper for firms (Botosan 1997) then managers may want to disclose more segment line items than what the standard suggests. Lang & Lundholm (2000) find that firms increase disclosure activity half a year before issuing equity. Botosan & Harris (2000), however, find no relation between increases in segment disclosure in half-year reports and companies' propensity to access the capital markets. Finally, companies could also be over-disclosers because that is a trait of their overall disclosure policy, potentially due to size and pressure from various stakeholders that create incentives to provide a lot of information.

H1b. Compared to box-tickers, over-disclosers of segment reporting quantity have incentives for transparent financial reporting.

The quality of segment reporting (*SRQl*), i.e., whether the operating segments are properly defined and aggregated, is less visible and harder to understand compared to quantity. Moreover, there is no benchmark for what it should be. Hence, we group the companies in our sample based on their values for *SRQl* into high/average/low quality and investigate the determinants of the probability to choose to be in one of the top and bottom groups compared to the average group. Prior literature has shown that financial performance concerns shape managers' decisions on segment aggregation. Segment profitability (Berger & Hann 2007) and segment earnings growth (Wang et al. 2011) are the relevant pieces of segment information that managers would want to hide because they provide information on the sources of overall firm performance. When financial performance is overall low, managers would want to hide their bad decisions by "smoothing" the performance of the

reported segments. They can achieve this smooth pattern by improperly aggregating operating segments. When financial performance is overall high, managers have incentives to show that they have made good diversification decisions and would be keener to show high quality segmentation. On the flipside, managers of firms with low overall firm performance may want their investors to be able to discriminate between the segments that perform well and those that do not, and so would provide high segment reporting quality. Given these arguments, we test the following hypotheses for the determinants of the choice to be in a low or high quality group.

H1c(d). Compared to the average quality group, companies in the low (high) quality group have worse (better) financial performance.

Quantity, quality, and financial analysts' forecast accuracy

Given all the options managers have when disclosing information about reported segments, a natural question is whether users distinguish between the different groups of companies. We focus particularly on financial analysts because they are important and sophisticated users of accounting information for whom segment reporting provides useful information (Healy et al. 1999; Ramnath et al. 2008). The literature reviewed above highlights the importance of segment information for analysts' ability to forecast earnings. The analytical literature on voluntary disclosure finds that disclosing more accounting information decreases information asymmetry between managers and capital market participants (Lambert et al. 2007). Empirically, financial analysts make more accurate earnings forecasts when managers provide more information about accounting policies (Hope 2003b) and more risk disclosures (Bozzolan et al. 2009). Given the theoretical and empirical findings on the usefulness of larger quantities of accounting information for analysts', we expect their accuracy to improve with more segment reporting quantity.

H2a(b). Compared to box-tickers, financial analysts' earnings forecast error for under-disclosers (over-disclosers) is higher (lower).

Financial analysts have repeatedly requested changes in segment reporting standards (Herrmann & Thomas 2000; Street et al. 2000; ESMA 2011) with particular focus on the way operating segments are defined and aggregated. We interpret this as demand and pressure from analysts for managers to provide high quality segment aggregations. Moreover, since analysts have extensive knowledge about the covered companies, they are in a good position to understand and distinguish between high and low quality segment disclosures. These arguments lead us to hypothesize lower forecast accuracy for companies in the low quality group, and higher accuracy for companies in the high quality group, relative to the average quality companies. If, however, analysts get most of their information from privately interacting with management (Soltes 2012) and operating segment aggregation matters less to them because of that, then their forecast accuracy will not depend on the quality group to which the company belongs. Another alternative is, of course, that our assumption that analysts are able to pick up segment reporting quality is not supported by the data.

H2c(d). Compared to the average quality group, financial analysts' earnings forecast error for the low (high) quality group is higher (lower).

So far we have hypothesized the independent effect of quantity, and respectively, quality on financial analysts' forecast accuracy. Since these are both characteristics of the same type of disclosure, their effect on forecast accuracy is a joint one rather than an independent one. Therefore, we also investigate the effect of combined quantity and quality groups on analysts' forecast error. Without formally stating the hypotheses, we expect that, compared to the low quality-low quantity group, being in a higher group on both dimensions allows analysts to do a better job at forecasting the company's earnings. This prediction is based on the argument that the informativeness of segment disclosures comes not just from

one of its dimensions, but from both. In order for the segment note to be informative, users must be given proper information to discriminate between the various businesses of the company *and* enough information at the segment level to understand the future prospects of the components of the entity.

Segment disclosure quality when line-item disclosure follows standard suggestions

As discussed above, we expect companies that choose to provide low disclosure quantity to have higher proprietary and agency costs compared to the companies that choose to provide the line items suggested in the standard. The latter are companies that might nevertheless face costs related to the product markets and the relation between managers and shareholders. However, they might choose to solve these proprietary and agency concerns differently. Rather than decreasing the number of segment line items disclosed, *Box-tickers* might decrease the quality of the segments they report. In this way, overall segment disclosure informativeness for competitors and shareholders is decreased without this being "too visible" and in keeping with standard setters' guidance.

In predicting the behavior of *Box-tickers* with respect to disclosure quality we assume a sequential decision process in which managers first set segment reporting quantity and only afterwards think about segment reporting quality. The discretion that managers can exercise on quantity compared to quality provides the basis for this assumption. Besides the benchmark that the standard provides for segment line items, prior disclosure by the same company creates a second benchmark (Einhorn & Ziv 2008; Graham et al. 2005). One line item shown this year but missing the next is bound to raise questions from financial analysts. For example, prior research finds that managers' decision to issue guidance one year heavily relies on their prior behavior and on how they think the stock market is going to interpret guidance discontinuance (Tang 2014). A third benchmark for segment line items is created by

the behavior of peer companies since managers tend to benchmark their disclosure to that of other companies (Botosan & Harris 2000; McCarthy & Iannaconi 2010; Tarca et al. 2011). Therefore, the managers' discretion over their own voluntary disclosure is limited by a number of factors which primarily tie back to line-item disclosure being easy to "see" and compare.

Changing the aggregation of an operating segment from one reportable segment to another or transferring some expenses from one reportable segment to the other (Lail et al. 2013; You 2014) could be done without any "visible" changes to the segments.[16] Decreased visibility, in turn, makes such a choice less likely to raise eyebrows. From this perspective, segment reporting quality is more prone to managerial discretion on a year-to-year basis than segment reporting quantity. Therefore, we hypothesize that companies that closely follow the standard suggestions in terms of line-item disclosure use the discretion they have on segment reporting quality when they are subject to high proprietary and agency costs.

H3a. Box-tickers solve their concerns about proprietary and agency costs by decreasing segment reporting quality.

In line with our investigations above, we also examine whether disclosure quality matters for financial analysts in a "constant quantity" setting. To some extent, this test could be interpreted as a cleaner test for whether analysts pick up on disclosure quality when they are provided with the level of information suggested in the standard. Our expectation is that indeed high (low) quality reporting is associated with lower (higher) forecast errors. However, if analysts' judgment is based primarily on disclosure quantity, then differing quality will have no association with their ability to make accurate earnings forecasts.

[16] Changes in the composition of reported operating segments could occur for many other legitimate reasons, from mergers and acquisitions to formal internal reorganizations and divestitures, and these events may or may not lead to changes in segment names and descriptions. It is very hard, therefore, to pick up the "real" discretionary changes in operating segments in an empirical archival research setting.

H3b(c). Conditional on the company being a box-ticker, financial analysts' earnings forecast error is lower (higher) for the high (low) quality group compared to the average quality group.

3. Research design

Our measure of segment reporting quantity (*SRQt*) is straightforward, but requires data collection from firm's segment note to financial statements. We count the number of accounting items disclosed per segment. For example, if a firm has four segments and discloses the following accounting items: segment sales, profit, assets, liabilities, and capital expenditures for each of the four segments, then *SRQt_Raw* is equal to five.

We measure *SRQl* as the quality of operating segment aggregation into reportable operating segments based on the cross-segment profit variability in Ettredge et al. (2006). Properly aggregating operating segments based on their economic similarity leads to differences in the profitability of the reported segments. In turn, managers' incentives to improperly aggregate operating segments lead them to disclose a smooth pattern of profitability across segments.[17] Ettredge et al. (2006) compute cross-segment profit variability as the largest return on sales (*ROS*) minus the smallest *ROS* for the segments of the same company.[18] We adjust their measure (1) by using return-on-assets (*ROA*) instead of *ROS* since *ROA* is a more comprehensive measure of profitability and (2) by directly taking into account industry-level profitability weighted by the proportion of total assets allocated to each segment.[19]

$$ROA_{s,i} = OperatingProfit_{s,i}/Assets_{s,i}$$

[17] We conducted two interviews with a former sell-side equity research analyst with Morgan Stanley and a credit analyst with OFI Asset Management in Paris, France in April 2014. These financial analysts also confirm that cross-segment profit variability is a reasonably good proxy for the quality of disclosed operating segments.
[18] They control for inherent cross-segment profit variability using the profitability of single-segment firms in the same industries as a multiple-segment firm's segments.
[19] The adjusting procedure is similar to the one used in Lail et al. (2013).

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

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

Where *s* is an indicator going from 1 to *k*, and *k* is the number of firm *i*'s segments.

We acknowledge two limitations related to this measure of *SRQl*. First, the segment operating profit used to compute *ROA* is as reported. Since, unlike their previous versions, IFRS 8 and SFAS 131 do not define segment result, different companies may have different definitions for this item. Ettredge et al. (2006) and Lail et al. (2013) also discuss this issue. In addition, Berger & Hann (2007) remark that it is not always clear whether segment assets as recorded in the databases comprise both non-current and current assets. Due to asset allocation policies, some companies allocate and disclose only non-current assets at segment level, but this line item gets recorded as segment assets in the databases. For a random set of companies in our sample we have checked the denomination of the segment assets line-item disclosed in the note to financial statements. Although it might still be an issue, following this verification, we are reasonably confident that the companies in our sample tend to allocate both non-current and current assets at segment level, such that the segment assets line item is the equivalent of total assets.

Second, capturing the discretionary aspect of operating segment aggregation means we have to control for the "natural" profit variability in a company's segments. We benchmark segment profitability to single-segment firms' profitability based on the industry code Worldscope assigns to the segment. While this is common in the literature (e.g., Lail et al. 2013; You 2013), we acknowledge that segments of conglomerates are not always comparable to single-segment firms due to systematic differences hard to control for (Graham et al. 2002), which means using single-segment profitability as benchmark may not always be meaningful.

We test the determinants of the continuous measures *SRQt* and *SRQl* using cross-sectional least-squares regressions. These tests allow us to understand what drives managers' decisions on the quantity of line items and the quality of operating segment aggregation in the full sample. We omit firm and time subscripts for ease of exposition.

$$SRQt\ (or\ SRQl) = \beta_0 + \beta_1 Herf + \beta_2 R\&D + \beta_3 LnMgOwners + \beta_4 ROA + \beta_5 Loss + \beta_6 M\&A + \beta_7 Big4 + \beta_8 LengthAR + \beta_9 ADR + \beta_{10} EqIssue + \beta_{11} BTM + \beta_{12} LnTA + Industry\ Fixed\ Effects + \varepsilon \quad (1)$$

Following prior literature on segment information (Harris 1998; Botosan & Stanford 2005; Berger & Hann 2007), we proxy for industry-, and product market-related proprietary costs using the Herfindahl industry concentration index (*Herf*) computed as the sum of the squared market share of all firms at two digit SIC-level over the Thomson Reuters population of listed companies in the sample countries. High values of *Herf* reflect high concentration and low levels of competition in that industry (Depoers & Jeanjean 2012).[20] Our second proxy for proprietary costs relates to proprietary costs arising from innovation activities (*R&D*) and is computed as the natural logarithm of 1 plus research and development expenditures divided by lagged total sales. Following prior literature (e.g., Ellis et al. 2012), we set the variable to 0 where R&D expenditures are missing. High investment in R&D activities increases the firm's proprietary costs due to innovation.

We proxy for agency conflicts with a measure of managerial ownership (*LnMgOwners*) computed following Lennox (2005) as the natural logarithm of the percent of outstanding shares owned by current executive directors. Although aimed at aligning managers' and shareholders' interests, management ownership affects agency costs in two ways: divergence of interests when managers hold low or high stakes in the company's stock

[20] According to Ali et al. (2014), high industry concentration could be interpreted as either low or high industry competition, leading to different predictions of the relation between industry concentration and proprietary costs. In developing our predictions, however, we rely on *Herf* as interpreted in prior work on segment reporting.

and entrenchment when managers hold enough stock (i.e., intermediary ranges) to control the company (Morck et al. 1988). When managers hold little equity in the firm and shareholders are too dispersed to enforce value maximization, corporate assets may be deployed to benefit management rather than shareholders (Berle & Means 1932; Dey 2008). Management-controlled firms have considerable discretion in guiding the affairs of the corporation, and this discretion could be used to divert some resources from corporate shareholders (Morck et al. 1988). In contrast, owner-controlled firms do not have the same incentives to divert resources, since owner-managers would suffer directly from reduced share value (Jensen & Meckling 1976). Large publicly listed firms have low managerial ownership (Lennox 2005), making them more susceptible to divergence-of-interests in the low ranges of ownership. Therefore, low managerial ownership reflects management-shareholder agency conflicts and increased agency costs.

Three variables in our model are meant to capture firm performance. We use the return-on-assets (*ROA*), and an indicator variable for whether the company is making a loss in the current year (*Loss*) to capture firm profitability. We also use an indicator variable for whether the company was involved in mergers and acquisitions activity during the year (*M&A*) to capture firm performance because better performing firms have enough resources to engage in takeover activity.

Four variables proxy for firms' incentives to provide transparent disclosures. High quality auditors (*Big4*) are more likely to have their clients report high quality information and high quantities of information.[21] Companies' overall disclosure policy measured using the natural logarithm of the number of pages in the annual report (*LengthAR*) also proxies for firms' incentives to provide a certain level of information. We include an indicator variable for the US cross-listing status (*ADR*) to capture firms' incentives for increased transparency

[21] *Big4* is coded 1 for French firms audited by two Big 4 auditors or by one Big 4 and a local auditor, and 0 for the French firms audited by two local auditors since French regulations require joint audits. See, for example, (Francis et al. 2009; André et al. 2014).

due to the bonding effect (Coffee 2002). The amount of equity issued during the year divided by beginning-of-year market capitalization (*EqIssue*) proxies for firms' need to access the stock market for additional financing. Prior literature has shown that financing needs incentivize managers to increase the quantity of disclosures they make in order to reduce information asymmetry (Lang & Lundholm 2000). The model also includes controls for firm growth (*BTM*) and size as the natural logarithm of total assets (*LnTA*). Industry fixed effects capture the similarity of segment disclosure quality and quantity in the same industry and any sort of benchmarking of disclosure characteristics with industry peers (Botosan & Harris 2000).

In order to test what determines managers to deviate from an expected (i.e., average) value of quantity and quality, and choose a high/low disclosure quantity and disclosure quality group, we split the sample companies into three groups for each disclosure characteristic. To do this, we first create quartiles based on *SRQt_Raw* and *SRQl*. Companies in the bottom quartile of *SRQt_Raw* disclose fewer than 9 line items (*Under-disclosers*) while those in the top quartile disclose more than 14 line items (*Over-disclosers*). Companies in the two middle quartiles generally "tick" the number of line items suggested by the standard (*Box-tickers*). In a similar way, we obtain three groups based on *SRQl*. The bottom quartile is the *LowQl* group, the upper quartile is the *HighQl* group, and the two middle quartiles form the *AvgQl* group.

We run two multinomial logistic regressions to gain better insight into the determinants of the likelihood that managers will choose to be in a certain disclosure group. Results will show to what extent the hypothesized firm characteristics increase or decrease the probability that the company is an *Under-discloser* or an *Over-discloser* compared to the reference group of *Box-tickers*, and, respectively, has *LowQl* or *HighQl* disclosure, compared to the *AvgQl* group. As hypothesized in H1a, we expect the multinomial regression

coefficients on *Herf, R&D,* and *LnMgOwners* in the *"Under-disclosers vs. Box-tickers"* model to be positive and significant, meaning that high values for proprietary costs arising from market competition, and from innovation activities, and agency costs due to managerial entrenchment increase the likelihood that the company moves from the *Box-tickers* reference group into the *Under-disclosers* group. Based on our prediction in H1b, we expect the coefficients on *Big4, LengthAR, ADR,* and *EqIssue* in the *"Over-disclosers vs. Box-tickers"* column to be positive and significant. High values for these variables reflect firms' incentives to be transparent in their financial reporting which increase the likelihood that the company moves from the *Box-tickers* benchmark group into the *Over-disclosers* group. Confirming H1c and H1d rests on the coefficients for *ROA, Loss,* and *M&A* being negative and significant in the model predicting the likelihood of *LowQl* compared to *AvgQl,* and positive and significant in the model predicting the likelihood of *HighQl* compared to *AvgQl*.

We test our hypotheses for whether being in different disclosure characteristic groups makes a difference for financial analysts' ability to accurately forecast earnings with two models of earnings forecast error.[22]

$$FE_{it+1} = \beta_0 + \beta_1 Under - disclosers_{it} + \beta_2 Over - disclosers_{it} + \sum Control\ variables + Industry\ Fixed\ Effects + \delta_{it+1} \quad (2)$$

$$FE_{it+1} = \gamma_0 + \gamma_1 LowQt_{it} + \gamma_2 HighQl_{it} + \sum Control\ variables + Industry\ Fixed\ Effects + \theta_{it+1} \quad (3)$$

The magnitude of forecast error (*FE*) is the absolute value of the difference between actual and estimated earnings-per-share, scaled by the absolute value of actual earnings-per-share (e.g., Horton et al. 2013). We control for variables shown in prior literature (e.g., Bradshaw, Miller, & Serafeim, 2009; Lang & Lundholm, 1996; O'Brien & Bhushan, 1990) to

[22] We concentrate our financial analyst analyses on individual analyst accuracy rather than mean forecast error, dispersion, and/or analyst following because this allows us to run the models on analyst-firm observations, which increases the power of our tests. Models of mean error, dispersion, and analyst following are necessarily run on firm-level observations. Since our sample is small, the power of the test would be very much reduced.

impact analysts' forecast accuracy and which have been previously used in international studies examining at the properties of analysts' earnings forecasts (Tan et al. 2011; Preiato et al. 2013). Namely, we control for the firm's earnings quality with the standard deviation of residuals from the (Dechow & Dichev 2002) model of discretionary accruals (*EQ*) because analysts seem to take into account discretionary accruals when forecasting earnings (Givoly et al. 2011). Complexity in firm organization makes it harder for analysts to forecast earnings (Dunn & Nathan 2005), so we control for the reported number of segments (*Segments*). Larger companies are more likely to have high analyst coverage (Bhushan 1989) and more coverage from the business press (Kothari et al. 2009), so we also control for firm size (*LnTA*).[23] Forecasting earnings for loss-making companies is harder (Das 1998), so we control for whether the company made a loss in the previous year (*Loss*). Following prior literature, we use the number of financial analysts forecasting the earnings of the company in *t*+1 (*LnAnalysts*) to control for the firm's overall information environment (Ashbaugh & Pincus 2001).[24]

Companies that have turned to the capital market for financing during the previous year are more likely to have increased the frequency of their non-regulated disclosures and the amount of information they provide (Lang & Lundholm 2000), so we control for the amount of equity issuance in year *t* as a percent of lagged total market capitalization (*EqIssue*). We include *LengthAR* and an indicator variable for whether management provides an outlook for the *t*+1 earnings in year *t* earnings announcement press release (*Guidance*) based on hand-collected data to control for management's overall attitude towards disclosing information to capital markets, including forward-looking information, expected to improve forecast accuracy (Hassell et al. 1988; Williams 1996; Lang & Lundholm 1996; Healy et al.

[23] Using the number of distinct four-digit or two-digit industries in which the company operates instead of the number of reported operating segments does not significantly change the results.

[24] In this study, *LnAnalysts* and *LnTA* are correlated at 55%. In order to mitigate multicollinearity concerns, we also run the analysis using the orthogonalized value of *LnAnalysts* on *LnTA*. Results are very similar and inferences do not change.

1999). We use stock return volatility (*ReturnVolatility*) to proxy for firm-related news in the market (Duffee 1995; Lang & Lundholm 1996), book-to-market ratio (*BTM*) to proxy for a firm's growth, and *ADR* to proxy for a firm's commitment to another regulatory regime that improves the firm's information environment (Lang et al. 2003). In addition, we include industry fixed effects to account for differences in forecasting difficulty at the industry level. We run these models on cross-sectional firm-analyst observations to increase the power of the test, and cluster standard errors at the analyst level.

Since disclosing fewer line items in the segment note means providing less information about the firm's segments, we expect that compared to *Box-tickers*, financial analysts covering *Under-disclosers* are less accurate, i.e., we expect β_1 to be positive and significant (H2a). At the same time, since *Over-disclosers* disclose higher quantities of information compared to *Box-tickers*, analysts can use that extra information to make better earnings predictions, i.e., we expect β_2 to be negative and significant (H2b). If financial analysts are able to perceive the quality of operating segment aggregation, then their earnings forecast errors for *LowQl* companies are higher compared to the *AvgQl* group, i.e., γ_1 is positive and significant (H2c) and the forecast errors for *HighQl* companies are lower compared to the *AvgQl* group, i.e., γ_2 is negative and significant (H2d).

Up until now, we have focused on the determinants and consequences of disclosure quantity and quality viewed as independent decisions. We now turn our focus on managers' decisions vis-à-vis disclosure quality given that they have already decided on being a *Box-ticker* in terms of disclosure quantity. In order to test H3a, we run model (1) on the sample of *Box-tickers*, with *SRQl* as dependent variable. *Box-tickers* follow the suggestions in the standard and disclose more or less the same number of items as exemplified there. They seem to treat that number of line items as mandatory disclosure, and provide it regardless of the proprietary and agency costs they may be incurring. We hypothesize, however, that these

companies in turn solve their proprietary and agency costs by decreasing the quality of operating segment aggregation. Therefore, we expect positive coefficients for *Herf* and *LnMgOwners*, and a negative coefficient for *R&D*. To test hypotheses H3b and H3c for whether financial analysts are indeed able to differentiate segment reporting quality for the group of average *SRQt*, we run model (3) on the sample of *Box-tickers*. We predict that, compared to the reference group *AvgQl & Box-tickers*, companies in the *LowQl* group have higher forecast errors, i.e., the coefficient on *LowQl & Box-tickers* is positive and significant (H3b), while companies in the *HighQl* group have lower forecast errors, i.e., the coefficient on *HighQl & Box-tickers* is negative and significant (H3c).

4. Sample and results

Due to data collection requirements for segment reporting quantity, sample construction starts from the companies included in the STOXX Europe 600 index at 31 December 2009. The mandatory switch to IFRS 8 in 2009 allows firms to re-evaluate their segment disclosures and potentially break from existing disclosure habits, which makes the investigation of managers' disclosure decisions at this point in time all the more meaningful.

We delete 143 companies activating primarily in the financial industry (i.e., ICB codes 8000-8999), along with companies that follow US GAAP (10 companies), those without a segment footnote or that report a single segment (28 companies), companies for which two types of shares are included in the index (i.e., doubles; 4 companies) and companies that have been acquired and for which corporate documents are no longer available (14 companies). We further delete firms that do not report segment assets (62 companies) necessary for computing segment-level *ROA*, and companies whose main segmentation is geographical (69 companies). The final sample comprises 270 companies

with one year of data. Table 1 panel A illustrates the sample construction procedure. Where analyses are based on analyst-firm level data, the sample contains 7929 observations.

Sample companies are headquartered in 17 EU countries (table 1 panel B). There are 74 UK companies (37%), 38 French companies (14%), and 33 German companies (12%). Less than 10% of the sample companies come from each of the other countries. This distribution is similar to the country distribution in the overall STOXX Europe 600. Panel C in table 1 shows the industry composition of the final sample based on Industry Classification Benchmark (ICB) codes. There are 76 industrials (28%), 44 companies in the basic materials industry (16%), 37 consumer services companies (14%) and 35 consumer goods companies (13%). The other industries contain less than 10% of the sample companies.

Table 2 panel A reports descriptive statistics for the variables included in the analyses. The median (average) company discloses 11 (12) segment-level line items. The number of line items disclosed varies between 2 and 63. The median value of *SRQl* is 0.73 (mean value is 0.83). The values for the *Herf* exhibit a lot of variation, meaning that concentration levels vary among industries. The median company reports 4 segments, has *ROA* of 3.5%, has issued equity of 0.1% of its lagged market capitalization, has *BTM* of 0.44, 5 billion euros in assets, and around 180 pages in the annual report. The average company R&D expenditure is 1 euro for every 10 million euros in total sales. As expected for these relatively large listed companies, management ownership is low. Of the sample companies, 84% have been involved in acquisitions and 15% have made a loss in 2009, 15% are cross-listed in the US, 96% are audited by (at least) a Big4 auditor, and 69% disclose management guidance in the annual press release announcing the earnings for 2009. The median (mean) analyst-level forecast error for the sample companies is 7% (16%) of actual earnings.

Panel B in table 2 presents the distribution of the sample companies into groups of *Under-disclosers/Box-tickers/Over-disclosers* and *Low/Avg/HighQl*. In the groups based on

SRQt, there are 132 *Box-tickers*, 75 *Over-disclosers*, and 63 *Under-disclosers*. From a quality perspective, 135 companies have *AvgQl*, 68 have *HighQl*, while 67 have *LowQl*. The bulk of the analyses that follow aims to improve our understanding of why managers choose to be in one of these groups versus another and whether this has any implications for financial analysts' earnings forecasting abilities.

Table 2 also presents the correlation matrices for the variables used in the determinants (panel C) and consequences (panel D) analyses. The nonparametric correlation coefficient between *SRQt* and *SRQl* is 4% and not significant at conventional levels. The highest correlations are between *ROA* and *Loss* (-61%), between *ROA* and *BTM* (58%), and between *LnAnalysts* and *LnTA* (55%). All other correlation coefficients are below 50%. The strongest correlation of *SRQt* is with *LengthAR* (29%, significant at 1%), while the strongest correlation of *SRQl* is with *ROA* (15%, significant at 1%). The correlation between *FE* and *SRQl* is -5%, significant at 1%, and between *FE* and *SRQt* is 12%, significant at 1%.

We begin by testing the determinants of the continuous measures for *SRQt* and *SRQl* in least-squares regressions (table 3 panel A). The sample contains 270 observations. The models include industry fixed effects defined at the one-digit ICB code level, and standard errors are adjusted for heteroskedasticity. Throughout the paper, even when we have a predicted sign, statistical significance of regression coefficients is based on two-sided t-tests. The dependent variable in model 1 is *SRQt*. The number of segment-level line items is positively associated with companies' overall disclosure policy proxied by *LengthAR* (coefficient 0.22, t-value 3.00), and with *BTM* (coefficient 0.21, t-stat 3.53). Involvement in *M&A* is also positively associated with *SRQt* (coefficient 0.13, t-stat 2.03) perhaps because managers with a penchant for takeovers feel the need to give more information about their activity to investors. Cross-listing in the US seems to decrease the number of reported segment line items (coefficient on *ADR* is -0.14, t-stat -2.37), consistent with the findings in

(Hope et al. 2013), who show that compared to matched US firms, cross-listed ones disclose management earnings guidance less frequently and of lower quality. Accessing the capital markets during the year for additional financing (*EqIssue*) is also negatively related to *SRQt* (coefficient -0.15, t-stat -2.01). Our proxies for proprietary and agency costs are not significantly associated with the continuous measure for *SRQt*.

The dependent variable in model 2 is *SRQl*. Good firm performance as proxied by *ROA* (coefficient 0.51 t-stat 2.16) and *M&A* (coefficient 0.11, t-stat 2.67) is significantly positively associated with *SRQl*. Loss-making firms as captured by the dummy variable *Loss* report lower quality segments (coefficient -0.08, t-stat -1.96). This supports our arguments that better performing companies will also disclose high quality operating segments. Auditor quality is positively associated with *SRQl* at significance level 1% (coefficient on *Big4* is 0.11, t-stat 3.51). Adjusted R^2 for the two models are 14%, and 18%, respectively, and the models are significant at 1%.

Panel B in table 3 reports the results from two multinomial logistic models used to test H1a-H1d. The likelihood ratio for both models is significant at 1%, and the values for the pseudo-R^2 are 23% and 29%, respectively. Columns 1 and 2 report the results of a multilogit model which examines the determinants of the choice to be an *Under-discloser* versus a *Box-ticker*, and an *Over-discloser* versus a *Box-ticker*. The coefficient on *Herf* is positive and marginally significant. Therefore, the higher the industry concentration, the more likely the company is an *Under-discloser*. If high industry concentration makes managers wary of disclosing information that could help potential new entrants gain a foot in the market, then proprietary costs related to new entry lead managers to be *Under-disclosers*. The coefficient on *LnMgOwners* is positive and significant at 5%. The higher the management stock ownership, so the more it is closer to the intermediary ranges where the manager becomes entrenched, the more likely the company is an *Under-discloser*. The coefficient on *R&D* is

positive, as expected, but not significant. Overall, we interpret this evidence cautiously as suggesting that certain proprietary and agency costs lead firms to report fewer items than suggested by the standard. H1b predicts positive coefficients on the variables proxying for firms' incentives to be transparent (*Big4*, *LengthAR*, *ADR*, *EqIssue*). Only the coefficient on *LengthAR* is positive and significant at 1%, meaning that companies which have a general policy of high level disclosure also disclose more segment-level line-items.

Columns 3 and 4 report the results of a multilogit model with *AvgQl* as reference group. We find no support for H1c, the variables proxying for firms' financial performance are not playing a significant role in managers' decision to provide *LowQl* segment reporting. This would suggest that there is no difference in financial performance between *LowQl* and *AvgQl* firms. The coefficients on *ROA* and *M&A* in the *HighQl* decision model are positive and significant at 1% and 5%, respectively, suggesting that, compared to *AvgQl* firms, better firm performance leads managers to disclose higher quality segment information.

In order to test H2a-H2d, we run cross-sectional least-squares regressions on a sample of 7929 analyst-firm level observations, with analyst-firm earnings forecast error (*FE*) as dependent variable, and indicator variables for the groups to which a firm belongs as independent variables of interest. The models in table 4 panel A include a range of control variables as discussed in the previous section, industry fixed effects, and standard errors are clustered at analyst level.[25] In model 1, the benchmark group is *Box-tickers*. Compared to them, being in the *Under-disclosers* group is associated with higher forecast error (coefficient 0.03, t-stat 4.16). Therefore, providing fewer segment line items makes it harder for financial analysts to accurately forecast next year's earnings. Going overboard, however, seems to have a similar effect. The coefficient on *Over-disclosers* is positive and significant at 1%. One possible explanation for this result is that too much information at the segment level

[25] The coefficient signs for the control variables are as expected based on prior literature.

increases analysts' information processing costs, and this decreases their ability to forecast earnings. Results, therefore, support H2a, but are opposite as predicted in H2b.

In model 2, the independent variables of interest are the groups based on *SRQl*. The benchmark group is *AvgQl*; compared to it, companies in the *HighQl* group have lower forecast errors (coefficient -0.02, t-stat -2.89), providing support for our hypothesis H2d. Forecast error for the companies in the *LowQl* group is not different from the mean forecast error for the benchmark group, lending no support for H1c. It seems, therefore, that being able to discriminate the entity's segments indeed helps analysts' ability to forecast earnings, but that lower quality disclosures do not affect their accuracy. Either analysts cannot differentiate low quality from an average quality of segment reporting, or they contact the company for private information from management when they believe segment reporting is not helping them discriminate between the company's businesses.

Our results so far were based on the assumption of independence between quality and quantity. In table 4 panel B we test how the interaction between these two dimensions contributes to financial analysts' forecasting accuracy. In order to do this, we interact the three groups based on *SRQt* with the three groups based on *SRQl*. The benchmark group is *LowQl & Under-disclosers* and we eliminate companies in the groups *LowQl & Box-tickers*, *LowQl & Over-disclosers*, *AvgQl & Under-disclosers*, and *HighQl & Under-disclosers* because we have no priors to predict their behavior (i.e., to understand why they chose to be at the extremes on the second diagonal in table 2 panel B) or to predict how financial analysts deal with these firms.[26] We are left with 172 companies, or 4924 analyst-firm observations for this analysis. As expected, compared to the *LowQl & Under-disclosers* group, being in any other interaction group benefits financial analysts by improving their forecast accuracy

[26] We believe that in-depth, case-study type of methodology could be useful to understand the disclosure behavior of these firms.

(coefficients are negative and significant at 1%). Adjusted R^2 for this model is 25%, and the model F-value is 40.16, significant at 1%.

In table 5, we restrict our analyses to the subsample of *Box-tickers* (132 firm observations). In panel A, we aim to understand what explains their choice of disclosure quality once they have decided to follow the standard suggestions in terms of the number of segment line items. We hypothesized that these companies choose to solve their proprietary and agency concerns by decreasing disclosure quality rather than decreasing the more "visible" disclosure quantity. Results confirm our predictions related to proprietary costs, but not to agency costs (i.e., partial support for H3a). We find a positive and significant coefficient on *Herf* (coefficient 0.49, t-stat 1.90), meaning that higher proprietary concerns due to the conditions in the product market drive companies who have already decided to provide the segment line items in the standard to decrease the quality of their segment disclosures. In the same vein, the coefficient on *R&D* is negative and significant (coefficient -0.66, t-stat -1.71) suggesting that increased proprietary concerns due to innovation lead managers to improperly aggregate operating segments and provide lower quality segment information. The coefficient on *LnMgOwners* is positive but not significant.

In panel B, we run the model with *FE* as dependent variable at analyst-firm level on the sample of Box-tickers, with the quality groups as independent variables of interest. The benchmark group is *AvgQl & Box-tickers*. The purpose of this test is to examine whether, financial analysts can differentiate between companies disclosing a constant (and similar) level of disclosure quantity but have differing disclosure quality. In other words, in this test the "visible" part of segment disclosures is kept constant and we investigate whether analysts are able to distinguish *High/LowQl* from *AvgQl*. Results suggest that financial analysts' forecast errors are higher for *LowQl* firms compared to *AvgQl* firms (coefficient 0.02, t-stat

2.13), confirming H3b, but that analysts make no distinction between *HighQl* and *AvgQl* firms (coefficient is negative but not significant at conventional levels).

5. Conclusions and policy implications

This paper aims to contribute to our understanding of the holistic nature of managers' disclosure strategy by focusing on the interplay between two disclosure characteristics – quantity and quality. We focus on segment reporting under the management approach, where managers have different degrees of discretion over the two disclosure dimensions. Our first set of results suggests that managers solve proprietary costs either by decreasing the quantity of information below standard guidance, or, if following standard suggestions, by decreasing information quality. This finding has implications for how researchers and regulators judge overall disclosure informativeness and is in line with investors and financial analysts' opinion that high disclosure quantity may sometimes act as a smokescreen for low quality.

Our second set of results suggests that financial analysts do not always pick up segment reporting quality and too much quantity may increase information processing costs and impair their ability to accurately forecast earnings. In light of standard setters' increasing interest for business-model based standards (Leisenring et al. 2012), these results advocate a cautious approach since it appears that even sophisticated users have difficulties with the "management approach."

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Appendix A: Variable definitions

Disclosure variables	
SRQt_Raw	The number of accounting items disclosed per segment in the segment reporting note to financial statements for the fiscal year 2009. Data is hand-collected from firms' financial statements.
SRQt	Natural logarithm of 1 plus *SRQt_Raw*.
Under-disclosers	1 if *SRQt_Raw* is in the 25th percentile, and 0 otherwise.
Box-tickers	1 if *SRQt_Raw* is between the 25th and 75th percentiles, and 0 otherwise.
Over-disclosers	1 if *SRQt_Raw* is above the 75th percentile, and 0 otherwise.
SRQl	Natural logarithm of 2 plus the range of segment return-on-assets adjusted for mean industry return-on-assets weighted by segment assets to total assets at the end of 2009. Data comes from Thomson Reuters Worldscope. We use log(2+x) to bring the distribution closer to the normal distribution following Berry (1987) and Liu & Natarajan (2012). The variable is winsorized at 95% to mitigate the influence of extreme values.
LowQl	1 if *SRQl* is in the 25th percentile, and 0 otherwise.
AvgQl	1 if *SRQl* is between the 25th and 75th percentiles, and 0 otherwise.
HighQl	1 if *SRQl* is above the 75th percentile, and 0 otherwise.
Determinants and consequences variables	
ADR	1 if the company is also listed in the US, and 0 otherwise, based on data from Thomson Reuters.
Big4	1 if company *i* is audited by a Big 4 auditor (Ernst&Young, Deloitte, KPMG, PriceWaterhouseCoopers) in 2009, and 0 otherwise, based on data from S&P Capital IQ.
BTM	Book-to-market ratio in 2009, based on data from Thomson Reuters.
EQ	The absolute value of residuals from a Dechow-Dichev (2002) model computed in-sample at the industry level. Data comes from Thomson Reuters. Higher values of absolute residuals mean lower earnings quality.
EqIssue	Amount of equity issued in 2009 divided by beginning of year market capitalization, based on data from S&P Capital IQ.
FE	Analyst-level earnings forecast error computed as the absolute value of the difference between the last yearly forecast estimate before the earnings announcement minus the actual earnings, deflated by absolute actual earnings. Data is for 2010 and comes from I/B/E/S. The variable is winsorized at 95% to mitigate the influence of extreme values.
Guidance	1 if the earnings announcement press release at the end of fiscal year 2009 contains an outlook/management forecast/guidance section, and 0 otherwise.

Herf	Industry competition measure computed as the sum of squared market shares in 2009, based on data from Thomson Reuters.
LengthAR	Natural logarithm of the number of pages in company *i*'s 2009 annual report.
LnAnalysts	Natural logarithm of the number of analysts covering the company in 2010, based on data from I/B/E/S.
LnMgOwners	Following Lennox (2005), management ownership is computed as the natural logarithm of the percentage of ordinary shareholdings of current executive directors, and 0 otherwise; computed based on data from S&P Capital IQ at the end of fiscal year 2009, or the closest available date.
LnTA	Natural logarithm of total assets for company *i* in 2009, based on data from Thomson Reuters.
Loss	1 if net income before extraordinary items is below 0, and 0 otherwise, based on data from Thomson Reuters.
M&A	1 if the company was involved in mergers or acquisitions during the year, and 0 otherwise. Data comes from Thomson Reuters Deal Scan.
R&D	Natural logarithm of 1 plus research and development expenditures during 2009, multiplied by one million to aid result exposition, divided by lagged total sales, based on data from Thomson Reuters. Where research and development expenditures are missing, the value is set to 0.
ReturnVolatility	Standard deviation of daily stock return during 2009. Data comes from Thomson Reuters Datastream.
ROA	Return-on-assets during 2009. Data comes from Thomson Reuters.
Segments	The number of segments reported by the company in its note to financial statements for the 2009 fiscal year. Data is hand-collected from the annual reports.

Table 1

Sample

Panel A: Sample construction

STOXX Europe 600 at 31/12/2009	**600**
(-) Financial institutions	-143
(-) Follow US GAAP	-10
(-) No segment footnote/Single segment	-28
(-) Doubles	-4
(-) Taken over in/after 2010	-14
(-) Missing segment asset data	-62
(-) Main segmentation is geographical	-69
(=) Total	**270**

This table describes the sampling procedure.

Panel B: Distribution of sample by country

Country	**Frequency**	**Percent**
Austria	5	1.85
Belgium	3	1.11
Switzerland	19	7.04
Germany	33	12.22
Denmark	3	1.11
Spain	15	5.56
Finland	15	5.56
France	38	14.07
UK	74	27.41
Greece	2	0.74
Ireland	4	1.48
Italy	11	4.07
Luxembourg	2	0.74
Netherlands	14	5.19
Norway	8	2.96
Portugal	6	2.22
Sweden	18	6.67
Total	**270**	**100**

This table reports the country distribution of companies in the sample.

Panel C: Distribution of sample by industry

Industry	**Frequency**	**Percent**
Basic Materials	44	16.30
Consumer Goods	35	12.96
Consumer Services	37	13.70
Health Care	13	4.81
Industrials	76	28.15
Oil and Gas	25	9.26
Technology	11	4.07
Telecommunications	12	4.44
Utilities	17	6.30
Total	**270**	**100**

This table presents the industry distribution of the companies included in the sample, based on one-digit Industry Classification Benchmark (ICB) classification codes.

Table 2

Descriptive statistics

Panel A: Descriptive statistics for the variables included in the main analyses

Variable	N	Mean	StdDev	Min	P25	Median	P75	Max
SRQt_Raw	270	12.400	6.739	2.000	9.000	11.000	14.000	63.000
SRQt	270	2.504	0.410	1.099	2.303	2.485	2.708	4.159
SRQl	270	0.832	0.271	0.693	0.711	0.738	0.803	1.820
Herf	270	0.119	0.096	0.028	0.056	0.079	0.161	0.801
R&D	270	0.018	0.048	0.000	0.000	0.000	0.012	0.325
LnMgOwners	270	0.178	0.556	0.000	0.000	0.009	0.074	3.258
ROA	270	0.043	0.062	-0.153	0.014	0.035	0.068	0.456
Loss	270	0.148	0.356	0.000	0.000	0.000	0.000	1.000
M&A	270	0.844	0.363	0.000	1.000	1.000	1.000	1.000
Big4	270	0.956	0.206	0.000	1.000	1.000	1.000	1.000
LnAnalysts	270	2.902	0.440	0.693	2.639	2.944	3.219	3.829
EQ	270	0.071	0.050	0.010	0.045	0.060	0.082	0.434
LengthAR	270	5.186	0.383	4.419	4.868	5.124	5.481	6.687
ADR	270	0.152	0.360	0.000	0.000	0.000	0.000	1.000
EqIssue	270	0.057	0.278	0.000	0.000	0.001	0.005	3.901
BTM	270	0.539	0.392	-0.076	0.298	0.447	0.693	3.547
LnTA	270	22.763	1.298	20.119	21.754	22.554	23.745	25.867
Segments	270	4.056	1.850	2.000	3.000	4.000	5.000	12.000
ReturnVolatility	270	0.223	0.189	0.030	0.107	0.179	0.281	1.566
Guidance	270	0.685	0.465	0.000	0.000	1.000	1.000	1.000
FE	7929	0.163	0.221	0.000	0.028	0.076	0.184	0.876

This table presents descriptive statistics for the variables used in the empirical analyses. The sample contains 270 firm-observations and is described in table 2. The sample for *FE* contains 7929 firm-analyst observations. See variable definitions in appendix A.

Panel B: Distribution of sample into groups based on *SRQl* and *SRQt*

		SRQt			
		Over-disclosers	*Box-Tickers*	*Under-disclosers*	**Total**
SRQl	*HighQl*	22	31	15	**68**
	AvgQl	39	66	30	**135**
	LowQl	14	35	18	**67**
	Total	**75**	**132**	**63**	**270**

This table presents the sample distribution into groups of *SRQl*, i.e., *High/Avg/LowQl* and *SRQt*, i.e., *Over-disclosers*, *Box-tickers*, and *Under-disclosers*. The sample contains 270 firm-observations and is described in table 1. Companies are split into groups based on whether their values for *SRQl* and *SRQt* in the bottom, upper, and two middle percentiles. See variable definitions in appendix A for more details.

Panel C: Correlation matrix for variables used in the determinants analyses

	(1)`	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1)SRQt	1	0.148**	-0.066	-0.124**	-0.081	-0.195***	0.083	0.185***	0.031	0.026	0.053	0.303***	-0.038	-0.064	0.255***	0.266***
(2)SRQl	0.040	1	-0.057	-0.070	0.033	0.073	-0.140**	0.074	0.063	-0.087	0.006	0.096	-0.049	-0.026	0.047	0.071
(3)Herf	0.014	0.004	1	-0.020	0.034	0.010	-0.026	-0.152**	-0.066	0.027	0.021	-0.044	0.052	0.008	0.035	0.081
(4)R&D	-0.127**	-0.061	-0.092	1	0.017	-0.018	0.064	0.081	0.038	-0.109*	0.039	-0.185***	0.008	-0.011	-0.098	-0.220***
(5)LnMgOwners	-0.180***	0.044	0.047	-0.009	1	0.018	-0.056	-0.063	-0.078	-0.073	0.038	0.051	0.019	-0.022	0.006	-0.048
(6)ROA	-0.192***	0.145**	-0.048	0.056	0.124**	1	-0.554***	-0.164***	-0.061	-0.040	-0.017	-0.200***	0.002	-0.202***	-0.433***	-0.288***
(7)Loss	0.105*	-0.086	0.061	0.029	-0.076	-0.615***	1	0.121**	-0.011	-0.032	0.119*	0.145**	-0.002	0.164***	0.365***	0.087
(8)M&A	0.167***	0.053	-0.139**	0.008	-0.121**	-0.179***	0.121**	1	0.007	0.087	-0.089	0.221***	0.096	0.039	0.091	0.144**
(9)Big4	0.018	0.012	-0.079	-0.035	0.011	0.022	-0.011	0.007	1	-0.023	0.009	-0.099	-0.009	0.023	-0.073	0.024
(10)LnAnalysts	0.057	-0.104*	0.059	-0.064	-0.202***	-0.083	-0.016	0.117	-0.016	1	-0.147**	0.377***	0.216***	-0.178***	0.035	0.516***
(11)EQ	0.083	0.140**	0.058	-0.073	0.082	-0.054	0.120	-0.129**	-0.013	-0.128**	1	-0.014	-0.018	0.052	-0.066	-0.208***
(12)LengthAR	0.287***	0.041	0.032	-0.155**	-0.159***	-0.299***	0.149**	0.269***	-0.098	0.397***	0.012	1	0.216***	-0.078	0.216***	0.569***
(13)ADR	-0.042	-0.053	0.043	-0.075	-0.012	-0.053	-0.002	0.096	-0.009	0.232***	-0.061	0.203***	1	-0.049	0.054	0.321***
(14)EqIssue	-0.093	0.008	0.070	-0.032	0.120**	0.055	-0.018	-0.084	-0.101*	-0.103*	-0.078	-0.028	-0.038	1	0.204***	-0.023
(15)BTM	0.248***	-0.126**	0.123**	-0.036	-0.059	-0.588***	0.300***	0.221***	-0.050	0.118*	-0.092	0.292***	0.041	0.045	1	0.348***
(16)LnTA	0.222***	-0.137**	0.105*	-0.176***	-0.165***	-0.351***	0.097	0.142**	0.031	0.554***	-0.210***	0.542***	0.287***	-0.038	0.455***	1

This table presents Pearson (above diagonal) and Spearman correlation coefficients (below diagonal) for the variables used in the determinants analyses. See variable definitions in appendix A. The sample contains 270 firm-observations and is described in table 2. Statistical significance is based on two-sided t-tests and is indicated as follows: *** p-value<0.01; ** p-value<0.05; * p-value<0.1.

Panel D: Correlation matrix for the variables used in the analyst earnings forecast accuracy analyses

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)SRQl	1	0.133***	-0.029**	0.032***	0.114***	-0.017	-0.122***	-0.020*	0.093***	-0.133***	-0.008	-0.077***	0.058***
(2)SRQt	0.014	1	0.075***	0.058***	-0.037***	0.072***	-0.038***	-0.071***	0.298***	0.082***	-0.077***	-0.030***	0.265***
(3)FE	-0.052***	0.120***	1	0.098***	0.008	0.389***	0.010	-0.105***	0.102***	0.359***	0.109***	0.059***	0.012
(4)EQ	0.143***	0.072***	0.111***	1	-0.115***	0.031***	-0.057***	0.067***	-0.007	0.114***	0.048***	-0.039***	-0.188***
(5)Segments	0.047***	-0.024**	-0.013	-0.082***	1	-0.095***	-0.076***	-0.144***	0.162***	0.011	-0.045***	0.007	0.338***
(6)ReturnVolatility	-0.024**	0.118***	0.312***	0.074***	-0.032***	1	0.197***	-0.063***	0.095***	0.413***	0.319***	0.019*	-0.018
(7)LnAnalystsRes	-0.100***	0.008	0.064***	-0.008	-0.056***	0.221***	1	-0.120***	0.120***	0.078***	-0.085***	0.009	0.081***
(8)Guidance	-0.058***	-0.059***	-0.102***	0.019*	-0.140***	-0.012	-0.146***	1	-0.075***	-0.135***	0.042***	0.025**	0.005
(9)LengthAR	0.026**	0.288***	0.151***	-0.004	0.183***	0.149***	0.110***	-0.052***	1	0.096***	-0.074***	0.205***	0.569***
(10)Loss	-0.067***	0.108***	0.268***	0.105***	0.030***	0.352***	0.101***	-0.135***	0.098***	1	0.142***	-0.027**	0.038***
(11)EqIssue	0.045***	-0.130***	-0.033***	-0.084***	0.058***	-0.065***	-0.135***	0.084***	0.015	-0.044***	1	-0.065***	-0.027**
(12)ADR	-0.085***	-0.036***	0.057***	-0.081***	0.052***	-0.026**	0.005	0.025**	0.187***	-0.027**	-0.081***	1	0.357***
(13)LnTA	-0.129***	0.222***	0.066***	-0.210***	0.391***	0.039***	0.074***	0.001	0.557***	0.043***	0.008	0.341***	1

This table presents Pearson (above diagonal) and Spearman correlation coefficients (below diagonal) for the variables used in the analyst earnings forecast accuracy analyses in table 8. See variable definitions in appendix A. The sample contains 7929 firm-analyst observations. Statistical significance is based on two-sided t-tests and is indicated as follows: *** p-value<0.01; ** p-value<0.05; * p-value<0.1.

Table 3

Tests of determinants of segment disclosure quantity (*SRQt*) and segment disclosure quality (*SRQl*)

Panel A: Least-squares analyses for continuous dependent variables

	(1)			(2)		
	SRQt			SRQl		
Variables	**Coeff**	**t-stat**	**p-value**	**Coeff**	**t-stat**	**p-value**
Herf	-0.202	(-0.88)	0.380	0.152	(1.55)	0.122
R&D	-0.455	(-0.87)	0.386	-0.215	(-1.01)	0.312
LnMgOwners	-0.058	(-1.03)	0.303	0.023	(0.82)	0.414
ROA	-0.494	(-1.08)	0.283	0.513**	(2.16)	0.032
Loss	-0.077	(-0.96)	0.339	-0.079*	(-1.96)	0.052
M&A	0.127**	(2.03)	0.044	0.107***	(2.67)	0.008
Big4	0.102	(0.93)	0.355	0.106***	(3.51)	0.001
LengthAR	0.222***	(3.00)	0.003	0.065	(1.16)	0.246
ADR	-0.138**	(-2.37)	0.019	-0.047	(-1.02)	0.307
EqIssue	-0.154**	(-2.01)	0.046	-0.028	(-0.86)	0.390
BTM	0.205***	(3.53)	0.001	0.095*	(1.93)	0.055
LnTA	0.022	(0.99)	0.324	-0.020	(-1.48)	0.140
Intercept	0.694	(1.25)	0.212	0.714**	(2.07)	0.039
Industry FE	YES			YES		
F-value	3.10***		<.0001	3.94***		<.0001
Adj-R^2	0.135			0.179		
N	270			270		

This table reports results from OLS cross-sectional multivariate models with *SRQt* as continuous dependent variable in model (1) and *SRQl* as continuous dependent variable in model (2). The models include industry fixed effects. Standard errors are adjusted for heteroskedasticity. The sample contains 270 firm-observations. Statistical significance is based on two-sided t-tests (t-stats in parentheses) and is indicated as follows: *** p-value<0.01; ** p-value<0.05; * p-value<0.1. See variable definitions in appendix A.

Panel B: Multinomial logistic analyses for deviations from average *SRQt* and from average *SRQl*

	(1)			(2)			(3)			(4)		
	Under-disclosers vs. Box-tickers			***Over-disclosers vs. Box-tickers***			***LowQl vs. AvgQl***			***HighQl vs. AvgQl***		
Variables	**Coeff**	**t-stat**	**p-value**	**Coeff**	**t-stat**	**p-value**	**Coeff**	**t-stat**	**p-value**	**Coeff**	**t-stat**	**p-value**
Herf	3.135*	(3.11)	0.078	2.387	(1.49)	0.223	4.852**	(5.47)	0.019	4.834**	(4.79)	0.029
R&D	1.304	(0.12)	0.724	-1.621	(0.14)	0.711	3.991	(1.30)	0.254	-6.583	(1.21)	0.272
LnMgOwners	0.579**	(4.15)	0.042	0.099	(0.09)	0.766	0.402	(1.90)	0.168	0.267	(0.58)	0.445
ROA	2.421	(0.57)	0.452	-2.278	(0.30)	0.587	-5.812	(1.26)	0.262	12.362***	(8.75)	0.003
Loss	0.338	(0.30)	0.582	-0.126	(0.05)	0.819	-0.751	(1.58)	0.209	-0.828	(1.36)	0.243
M&A	-0.127	(0.08)	0.784	1.031*	(2.92)	0.087	0.240	(0.25)	0.617	1.260**	(5.04)	0.025
Big4	0.457	(0.31)	0.578	0.842	(1.03)	0.310	-0.284	(0.13)	0.723	0.568	(0.35)	0.553
LengthAR	0.573	(0.97)	0.325	1.831***	(11.18)	0.001	-0.344	(0.39)	0.533	0.898	(2.41)	0.121
ADR	0.290	(0.32)	0.574	-0.711	(1.88)	0.171	-0.199	(0.15)	0.694	-0.630	(1.27)	0.261
EqIssue	0.305	(0.29)	0.589	-0.304	(0.19)	0.662	0.843	(0.94)	0.334	1.152	(1.44)	0.230
BTM	-1.016	(2.22)	0.137	0.315	(0.45)	0.505	0.216	(0.22)	0.642	0.329	(0.31)	0.581
LnTA	-0.293	(2.38)	0.123	-0.239	(1.81)	0.178	0.261	(1.93)	0.165	-0.183	(0.89)	0.346
Intercept	0.126	(0.00)	0.975	-8.033	(4.85)	0.028	-4.930	(1.76)	0.185	-3.628	(0.79)	0.373
Industry FE	YES						YES					
Likelihood Ratio	70.406***						93.984***					
Pseudo R^2	0.230						0.294					
N	270						270					

This table reports results from two multinomial logit regressions. For columns (1) and (2), the dependent variable is ordinal and based on whether the company belongs to one of the three groups of *SRQt*. Firms in the bottom quartile of *SRQt* are classified as *Under-disclosers*, those in the top quartile are classified as *Over-disclosers*, and those in the middle two quartiles are classified as the benchmark group (*Box-tickers*). Column (1) presents the results for a model predicting the likelihood that a company will be in the *Under-disclosers* group, while column (2) presents the results for a model predicting the likelihood that a company will be in the *Over-disclosers* group. For columns (3) and (4), the dependent variable is ordinal and based on whether the company belongs to one of the three groups of *SRQl*. Firms in the bottom quartile of *SRQl* are classified as *LowQl*, those in the top quartile are classified as *HighQl*, and those in the middle two quartiles are classified as the benchmark group (*AvgQl*). Column (3) presents the results for a model predicting the likelihood that a company will be in the *LowQl* group, while model (4) presents the results for a model predicting the likelihood that a company

will be in the *HighQl* group. The models include industry fixed effects. The sample contains 270 firm-observations. Statistical significance is based on two-sided t-tests (t-stats in parentheses) and is indicated as follows: *** p-value<0.01; ** p-value<0.05; * p-value<0.1. See variable definitions in appendix A.

Table 4

The importance of segment disclosure quality and quantity for financial analysts' earnings forecast accuracy

Panel A: Analysts' earnings forecast accuracy across groups of *SRQt* and *SRQl*

	(1)			(2)		
Variables	**Coeff**	**t-stat**	**p-value**	**Coeff**	**t-stat**	**p-value**
Under-disclosers	**0.025*** **	**(4.16)**	**<.0001**			
Over-disclosers	**0.047*** **	**(7.71)**	**<.0001**			
HighQl				**-0.017*** **	**(-2.89)**	**0.004**
LowQl				**0.007**	**(1.24)**	**0.215**
EQ	0.373***	(5.91)	<.0001	0.383***	(5.94)	<.0001
Segments	0.006***	(4.28)	<.0001	0.006***	(4.25)	<.0001
ReturnVolatility	0.317***	(19.11)	<.0001	0.319***	(19.21)	<.0001
LnAnalysts	-0.067***	(-8.55)	<.0001	-0.073***	(-8.82)	<.0001
Guidance	-0.022***	(-4.02)	<.0001	-0.028***	(-5.30)	<.0001
LengthAR	0.038***	(5.39)	<.0001	0.053***	(7.48)	<.0001
Loss	0.146***	(14.50)	<.0001	0.143***	(13.92)	<.0001
EqIssue	-0.015	(-1.13)	0.260	-0.019	(-1.44)	0.149
ADR	0.035***	(5.32)	<.0001	0.029***	(4.39)	<.0001
LnTA	-0.001	(-0.42)	0.678	-0.002	(-0.78)	0.435
Intercept	0.089*	(1.80)	0.071	0.069	(1.44)	0.149
Industry FE	YES			YES		
F-value	72.21***		<.0001	71.50***		<.0001
Adj-R^2	0.249			0.243		
Clusters	2628			2628		
N	7929			7929		

This table reports results from multivariate regression models with *FE* as dependent variable. In model (1), firms in the bottom quartile of *SRQt* are classified as *Under-disclosers*, those in the top quartile are classified as *Over-disclosers*, and those in the middle two quartiles are classified as the benchmark group (*Box-tickers*). In model (2), firms in the bottom quartile of *SRQl* are classified as *LowQl*, those in the top quartile are classified as *HighQl*, and those in the middle two quartiles are classified as the benchmark group (*AvgQl*). The model includes industry fixed effects. Standard errors are clustered at analyst level. The sample contains 7929 firm-analyst observations corresponding to the 270 companies included in the determinants analyses. Statistical significance is based on two-sided t-tests (t-stats in parentheses) and is indicated as follows: *** p-value<0.01; ** p-value<0.05; * p-value<0.1. See variable definitions in appendix A.

Panel B: Analysts' earnings forecast accuracy across groups of companies based on *High/Avg/LowQl* and *Under-disclosers/Box-tickers/Over-disclosers*

	FE		
Variables	**Coeff**	**t-stat**	**p-value**
HighQl & Over-disclosers	**-0.037*** **	**(-2.76)**	**0.006**
HighQl & Box-tickers	**-0.083*** **	**(-7.23)**	**<.0001**
LowQl & Box-tickers	**-0.055*** **	**(-4.84)**	**<.0001**
AvgQl & Box-tickers	**-0.076*** **	**(-6.95)**	**<.0001**
EQ	0.230***	(3.31)	0.001
Segments	0.003**	(1.98)	0.048
ReturnVolatility	0.324***	(13.26)	<.0001
LnAnalysts	-0.063***	(-7.61)	<.0001
Guidance	-0.043***	(-6.48)	<.0001
LengthAR	0.082***	(9.35)	<.0001
Loss	0.122***	(10.10)	<.0001
EqIssue	0.013	(1.01)	0.315
ADR	0.065***	(6.69)	<.0001
LnTA	-0.009**	(-2.54)	0.011
Intercept	0.126*	(1.93)	0.054
Industry FE	YES		
F-value	40.16		<.0001
Adj-R^2	0.248		
Clusters	2095		
N	4924		

This table reports results from a multivariate regression model with *FE* as dependent variable. Firms in the bottom quartile of *SRQt* are classified as *Under-disclosers*, those in the top quartile are classified as *Over-disclosers*, and those in the middle two quartiles are classified as *Box-tickers*. Firms in the bottom quartile of *SRQl* are classified as *LowQl*, those in the top quartile are classified as *HighQl*, and those in the middle two quartiles are classified as *AvgQl*. *'LowQl & Under-disclosers'* is the benchmark group. The sample contains 4924 firm-analyst observations corresponding to 172 companies. We eliminate from the sample the companies that are *Over-disclosers* but have *LowQl* or *AvgQl*, and those that are *Under-disclosers* but have *HighQl* or *AvgQl*. The model includes industry fixed effects. Standard errors are clustered at analyst level. Statistical significance is based on two-sided t-tests (t-stats in parentheses) and is indicated as follows: *** p-value<0.01; ** p-value<0.05; * p-value<0.1. See variable definitions in appendix A.

Table 5

Tests on the sample of *Box-tickers*

Panel A: Determinants of segment disclosure quality (*SRQl*) conditional on the company being a *Box-ticker*

		SRQl		
Variables	**Pred.**	**Coeff**	**t-stat**	**p-value**
Herf	**(+)**	**0.487***	**(1.90)**	**0.060**
R&D	**(-)**	**-0.661***	**(-1.71)**	**0.091**
LnMgOwners	**(+)**	**0.007**	**(0.15)**	**0.884**
ROA		0.801*	(1.92)	0.058
Loss		-0.092	(-1.53)	0.129
M&A		0.181***	(2.82)	0.006
Big4		0.124**	(2.45)	0.016
LengthAR		0.013	(0.17)	0.863
ADR		-0.019	(-0.29)	0.775
EqIssue		-0.035	(-0.88)	0.381
BTM		0.147**	(2.01)	0.047
LnTA		-0.033	(-1.29)	0.199
Intercept		1.178*	(1.75)	0.082
Industry FE		YES		
F-value		1.92**		0.017
Adj-R^2		0.124		
N		132		

This table reports results from an OLS cross-sectional multivariate model with *SRQl* as dependent variable and hypothesized determinants as independent variables, conditional on the company being in the *Box-ticker* group of *SRQt*. The model includes industry fixed effects. Standard errors are adjusted for heteroskedasticity. The sample contains 132 firm-observations. Statistical significance is based on two-sided t-tests (t-stats in parentheses) and is indicated as follows: *** p-value<0.01; ** p-value<0.05; * p-value<0.1. See variable definitions in appendix A.

Panel B: Analysts' earnings forecast accuracy across groups of companies based on groups of *High/Avg/LowQl*, conditional on the company being in the *Box-tickers* group

	FE		
Variables	**Coeff**	**t-stat**	**p-value**
HighQl & Box-tickers	**-0.006**	**(-0.86)**	**0.389**
LowQl & Box-tickers	**0.016****	**(2.13)**	**0.033**
EQ	0.076	(1.08)	0.281
Segments	-0.005***	(-2.84)	0.005
ReturnVolatility	0.283***	(11.38)	<.0001
LnAnalysts	-0.040***	(-5.23)	<.0001
Guidance	-0.054***	(-6.88)	<.0001
LengthAR	0.080***	(9.11)	<.0001
Loss	0.070***	(5.92)	<.0001
EqIssue	0.051***	(3.51)	0.001
ADR	0.058***	(5.35)	<.0001
LnTA	-0.009**	(-2.42)	0.016
Intercept	0.012	(0.16)	0.873
Industry FE	YES		
F-value	32.84		<.0001
Adj-R^2	0.221		
Clusters	1859		
N	3843		

This table reports results from a multivariate regression model with *FE* as dependent variable. Firms in the bottom quartile of *SRQt* are classified as *Under-disclosers*, those in the top quartile are classified as *Over-disclosers*, and those in the middle two quartiles are classified as *Box-tickers*. Firms in the bottom quartile of *SRQl* are classified as *LowQl*, those in the top quartile are classified as *HighQl*, and those in the middle two quartiles are classified as *AvgQl*. *'AvgQl & Box-tickers'* is the benchmark group. The model includes industry fixed effects. Standard errors are clustered at analyst level. The sample contains only those companies classified as *Box-tickers*, adding up to a total of 3843 firm-analyst observations corresponding to 132 companies. Statistical significance is based on two-sided t-tests (t-stats in parentheses) and is indicated as follows: *** p-value<0.01; ** p-value<0.05; * p-value<0.1. See variable definitions in appendix A.