The Shortcomings of Segment Reporting and their Impact on Analysts' Earnings Forecasts

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Working Paper

January 17, 2019

ASC 280 (SFAS 131)
IFRS 8
Forecast accuracy
Segment reporting

Abstract:

In this paper, we deliver US-sample based evidence that suggests that segment reporting under the "management approach" of ASC 280 (SFAS 131) biases analysts' earnings per share (EPS) forecasts. We show that the error in EPS forecasts corresponds to a profitability "gap" between profitability aggregated from segment reporting and profitability computed from consolidated financial statements. In particular, the forecast error is associated with the profitability gap–and even its direction–when reported segments lack major profitability components such as assets, revenue, or operating income. Furthermore, we find that the EPS forecast error increases with an increased segment split when controlling for diversification, which suggests that disaggregation per se does not improve the ability of security analysts to forecast earnings. Our panel consists of a sample of 591 US listed companies and covers the period 2009 to 2016.

1. Introduction

The necessity of understanding individual business activities and the importance of disaggregated information availability when analyzing companies and forecasting their earnings is long acknowledged and considered to be indispensable (e.g., Jenkins Committee, 1962; AIMR, 1993; AICPA, 1994; Epstein & Palepu, 1999). In this respect, *segment reporting* complements information given in consolidated *primary financial statements* (balance sheet, income statement, and cash flow statement, equity statement). Without segment reporting the consolidated financial statements, inherently, provide only limited information on individual business activities (Chen & Zhang, 2003). Accordingly, research documents that segment reporting provides new and useful information to analysts and investors, assists in forecasting earnings (Ettredge, Kwon, Smith, & Zarowin, 2005; Botosan, McMahon, & Stanford, 2011) and potentially reduces information asymmetries (Kajüter & Nienhaus, 2017).

However, segment reporting may not be useful per se. There are reasonable concerns that segment reporting under the *management approach* warrants earnings management on segment level and impairs segment-reporting quality (ESMA, 2011). Indeed, under the current approach of segment reporting,

- the disclosed *segment split* (i.e., disaggregation of consolidated financial statement information to report individual business activities as segments),
- the *granularity of reported line items* per segment,
- the *use of non-GAAP recognition and measurement principles for segment reporting,* and
- the *allocation of transactions* (i.e., revenue, assets, operating income, etc.) *to segments*

are highly discretionary. They provide the management "leeway" to manage earnings on segment level (Ettredge & Wang, 2015; Berger & Hann, 2007; Givoly, Hayn, & D'Souza, 1999; Lail, Thomas, & Winterbotham, 2014). Coupled with a lack of transparency of the actual criteria underlying management's segment reporting decisions, the management approach under ASC 280 (SFAS 131)–which is also adopted by IFRS 8–raises understandability and reliability concerns (e.g., ESMA, 2011; KPMG, 2010, 81).

In this paper, we use the *error in annual consensus EPS forecasts* as a metric to analyze the usefulness of segment reporting for US-companies, which report segments according to ASC 280 (SFAS 131). We link the EPS forecast error to the "gap" between profitability aggregated from segments and the firms' consolidated profitability. Based on annual reporting data *of 591 diversified US listed companies from 2009 to 2016*, we find that segments, which lack key profitability components (i.e., revenue, assets, and/or operating income) yield a statistically significant EPS forecast error.

Our findings suggest that analysts neglect segments with incomplete data per segment (transaction allocation) in their EPS forecasts. Analysts seem to focus on those segments with a "full story" (i.e., with a complete set of profitability components per segment). In contrast to prior literature that finds that the non-GAAP measurement "gap" between segment and consolidated statements affects stock returns (Wang & Ettredge 2015, Alfonso, Hollie, & Yu, 2012), we don't find a statistically significant effect of the use of non-GAAP measures for segment reporting on the

accuracy of forecasted EPS. Furthermore, another important finding in this study is that an increased segment split (i.e., more information) is not associated with a more accurate forecast. On the contrary, an increased segment split is associated with a lower forecast accuracy. This finding might result from the (poor) quality of the segment split disclosed by firms under the management approach, coupled with reduced line item granularity when the segment split is increased (Bugeja, Czernkowski, & Moran, 2015; Ettredge, Kwon, Smith, & Stone, 2006; Gotti, 2016).

2. Background, Literature and Hypotheses

Diversified companies are a bundle of individual business activities with different risk, return and growth profiles (Krüger, Landier, & Thesmar, 2015). Their assessment is inherently relevant for earnings forecasts and valuation analysis (Chen & Zhang, 2003; Botosan & Stanford, 2011). Hence, unwinding individual business activities of diversified firms is vital for understanding the firm as whole and underlines the importance of disaggregated information availability. Therefore, information provided in segment reporting should ideally correspond to the individual business activities and their idiosyncratic characteristics (e.g. Herrmann & Thomas, 2000; earlier Langdon, 1973; Collins, 1975). For example, analysts perceive segment reporting as more reliable when similar products, rather than dissimilar products are combined in a segment (Maines, McDaniel, & Harris, 1997).

Segment reporting under ASC 280 and IFRS 8

However, the discussion regarding how segment reporting should be designed–or even if it should exist at all–is almost half a century old (Jenkins Committee, 1962) and still a topic of debate and improvement, PIR IFRS (2017). The current approach to segment reporting under ASC 280 (introduced in 1997) and IFRS 8 (introduced in 2006) is the *management approach*. It addresses the aforementioned idea of splitting primary financial statements into segments based on the managements' perspective on business activities. It aligns external with internal reporting for segments. Analyst favor this congruency of internal and external reporting, since they perceive it as more reliable than a segment reporting approach that differs from the firms' perspective on business activities (Maines et al., 1997; Botosan et al., 2011).

The management approach replaced the former risk-reward approach that required segments to be reported according to risk-reward profiles of a firm's individual business or geographical activities and required the reporting of specific line items that had to be consistent with accounting principles used to prepare the primary financial statements. The standard setters expected the management approach to deliver 'more' useful information than the risk-reward approach. By taking the perspective of the chief operating decision maker on business activities, the management approach is expected to disaggregate consolidated financial statement information based on the risk and rewards that the management thinks is important (Nichols, Street, & Tarca, 2013). Hence, the internal view of the management is expected to reflect the management's "fair" view on segment performance and segment-related risk (Wang & Ettredge, 2015, p. 31).

However, the management approach undisputedly gives the management leeway to manipulate earnings information at the segment level (Wang & Ettredge, 2015). Research documents that firms shift income between reported segments with the aim of managing segment earnings (Berger & Hann, 2007; Lail et al., 2014). Since revenue and cost allocation requirements are tied to

management's discretion and are lacking transparency, managers have incentives to overemphasize or hide segment profitability when agency or proprietary costs avoidance is high (Givoly et al., 1999; Botosan & Stanford, 2005).

We identify the *segment split*, the *line item granularity,* the *recognition & measurement* of segment data, and the *allocation of transactions* to segments as the primary dimensions for the analysis of the quality of segment reporting. We therefore, briefly discuss these four dimensions and their implications on fundamental analysis and the EPS forecast error metric in order to develop our hypotheses.

Segment split

The adoption of the *management approach* increased the number of reported business segments (Herrmann & Thomas, 2000; Street, Nichols, & Gray, 2000; Berger & Hann, 2003) and reduced single segment reporting (Botosan & Stanford, 2005). In fact, an increased number of segments increases the available information. It allows diversified firms to report different business activities. This corresponds to the idea of increasing the disclosure on business activities with different idiosyncratic risk-reward characteristic (Herrmann & Thomas, 2000). However, more segment information does not necessarily increase the information value of segment reporting. If understandability is limited, analysis becomes less reliable (Maines et al., 1997) and analyst will base their forecasts more on the primary financial statements with stricter reporting requirements.

The segment split *criteria*–whether business activities have or have not been aggregated in segments–are seldom stated by companies in their reports and remain unclear (ESMA, 2011, KPMG, 2010, 81). This lack of transparency is particularly striking, given that firms have full discretion over changing the segment split at any time if justified by the management's view on the business activities. Inconsistencies over time but also between firms restrain understandability and reliability of the segment split. Furthermore, there are no strict requirements to allocate (annual and/or quarterly) cost and revenue to segments on a consistent basis. Quarterly segment reporting can deviate from annual segment reporting and must not add up to full year reporting numbers. Therefore, we hypothesize that:

H1: (After taking into account firm diversification,) segment split is positively associated with EPS forecast error.

Line item granularity

Detailed financial statement data (fundamental signals) flow into the decision making process of market participants (Abarbanell & Bushee, 1997). Profitability, growth and their drivers correspond to stock returns (Akbas, Jiang, & Koch, 2017, Cooper, Gray, & Johnson, 2011, Nissim & Penman, 2001). The literature emphasizes the importance of profitability metrics, such as operating profit margin and asset turnover and their development over time and cross-sections for market participants in forecasting earnings and future profitability (Fairfield & Yohn, 2001; Soliman, 2008). Hence, in order to serve earnings forecasts and valuation tasks the availability of line items per segment such as sales, costs and assets and their breakdown (i.e., nature of assets, costs, sales) is indispensable. If line item granularity is high and provided on segment level, it

fundamentally assists forecasting earnings and cash flows of individual business activities. It allows the assessment of overall firm fundamental risk and firm value.

However, line items disclosure is required only on key income statement items and only if the management uses these items for their decision-making (SFAS 131.27, similarly IFRS 8.23), which puts line item reporting per segment at the full discretion of the management.

In fact, firms appear to be resilient in providing a detailed line item breakdown of their business activities. Documenting the surfacing of a trade-off between line item disclosure and number of reported segments, studies find evidence of an actual reduction of line item disclosure when increasing the segment split following the implementation of the management approach (Bugeja et al., 2015; Ettredge et al., 2006; Gotti, 2016). In particular, key items such as assets per segment and capital expenditure per segment decrease while equity investments/income, income tax or interests expense/income marginally increase (Street et al., 2010; Hermann & Thomas, 2000).

Furthermore, the reported segment line items do not provide (and do not require) the necessary deepness to analyze the segment value drivers. Key line items such as income tax expense, interest revenue, interest expense, R&D expense, and similar, which would allow analysts to disentangle segment earnings into operating results, are only scarcely and selectively reported (Herrmann & Thomas, 2000). Other critical items such as leases, financial assets, or operating liabilities against customers and suppliers (advance payments, or accounts payable) are not required to be reported separately for segments at all and depend on the discretion of firms to report line items voluntarily.

Hence, line item granularity is helpful if it is comprehensive and reconcilable. However, given the incomplete and discretionary character of line item reporting per segment and no requirement to reconcile segment line items to the line items in the consolidated statements, firms will provide increased (vs. mandatory) line items granularity in order to avoid agency or proprietary costs (Givoly et al., 1999; Botosan & Stanford, 2005). Therefore, the concept of line item reporting under the management approach potentially distorts the perception of the analyst. As a result, we hypothesize that:

H2: Line item reporting is positively associated with EPS forecast error.

Non-GAAP segment accounting

Under the management approach, firms are allowed to use internal accounting principles for the recognition and measurement of line items (ASC 280-10-50-27, and similarly IFRS 8.25). However, non-GAAP measures may be difficult to interpret (e.g., IFRS 8, BC12). As a result, the recognition and measurement of segment line items might not add up to the earnings, the financial position or the cash flow presented in consolidated financial statement. The use of internal reporting policies in segment reports creates indeed a gap and requires reconciliation. However, a full reconciliation that tracks segment data mismatches back on the line item of financial statements is not required. Under the current standard, a reconciliation of totals is sufficient ASC 280-10-50-30, 55-49.

Studies that analyze the reconciliation gap find that segment reporting yields aggregated segment earnings in excess of consolidated earnings, a so-called negative gap (Wang & Ettredge

2015, Alfonso, Hollie, & Yu, 2012). This suggests an incomplete allocation of expenses or losses to segments. The negative gap is stronger associated with stock returns as opposed to a positive gap (i.e., consolidated earnings in excess of aggregated segment earnings); more frequent and larger gaps are associated with high proprietary costs and agency costs, and the gaps are positively associated with surrogates for income items that segment managers cannot likely be held responsible for (i.e., corporate intangibles, acquisition activity and special or unusual items) (Wang & Ettredge, 2015). Nevertheless, segment earnings appear to be incrementally useful to investors when measured against stock returns (Wang & Ettredge 2015, Hollie & Yu, 2012). However, the market appears to be mispricing the non-GAAP metrics, not acknowledging the information value of a reconciliation (Hollie & Yu, 2012), despite evidence that suggests that the gap is value-relevant (Alfonso et al., 2012).

It remains an open empirical question if this gap is associated with an error in analyst forecast. Following the approach of the before mentioned studies in principle, we calculate the gap between segment-based and consolidated statement-based, "profitability gap" and analyze its association with the forecast error.

Profitability of core business activities, as a key metric for business analysis and valuation, e.g. (Nissim & Penman, 2001; Penman, 2016), it is an "anchor" for each valuation exercise. It helps forecasting future earnings of the firm if profitability metrics effectively reveal operating profitability of individual business activities. A key prerequisite for this analysis task, however, is a disaggregation of business activities and a relevant line item reporting on segment level. A blurred picture of segment profitability is a setback that comes at the cost of a proper analysis of segment profitability and its usefulness in evaluating the firm's prospects. In fact, prior research also shows that the incremental information value of segment reporting is low and can be attributed to considerable measurement errors in reported segments (Chen & Zhang, 2003; Givoly et al., 1999).

Given the discretion that is left to the management by basing segment reporting on the internal reporting decision and given the low reconciliation needs, ASC 280-10-50-30, 55-49 (and similarly IFRS 8.28, IG4) as well as a lack of transparency and understanding of segment data, we hypothesize that

H3: A gap between profitability as obtained from consolidated primary financial statements and aggregated profitability as obtained from segment reporting positively associated with EPS forecast error.

Allocation of transactions to segments

Segment reporting might increase proprietary cost (i.e., managers conceal segments with relatively high abnormal profits to avoid harmful competition) or agency cost (i.e., managers hide segments with relatively low abnormal profits to protect their self-interest) of firms (Berger & Hahn, 2007; Wang, Ettredge, Huang, & Sun, 2011; Lail et al., 2014; Ettredge, Kwon, Smith, & Stone, 2006, Bugeja et al., 2015; Givoly et al., 1999). This creates incentives to the management of not revealing segment profitability properly under the management approach, except if forced to do so if, e.g. depending on external finance (Ettredge et al. 2006). Indeed, under the flexibility of the management approach, firms strategically report segment performance by shifting income between segments (Lail et al., 2014) and firms increased the number of segments under the

management approach without revealing significantly more about differences in segment profitability (Ettredge et al., 2006).

In this sense, we introduce a profitability gap metric that captures the effect of segments for which key profitability items are missing. Through this metric we investigate whether segments with an incomplete set of profitability items, have an effect on the forecast error. Given the mandatory reporting of key line items per segment, missing line items should be a result of transaction management. We calculate the profitability gap between segment reporting and the consolidated financial statements depending on missing profitability components for reported business segments. We hypothesize that

H4: The profitability gap from segments with missing profitability components (sales, assets, or/and operating income) is positively associated with EPS forecast error.

3. Research Design

In order to test our hypotheses, we regress the variables of interest on the forecast error. Our regression model is stated as:

$$F\_Error_{i,t} = \beta_0 + \beta_1 SplitBS_{i,t} + \beta_2 GranBS_{i,t} + \beta_3 PrftGap_{i,t} + \sum Controls + Industry\ FE + Year\ FE + \varepsilon_{i,t} \quad (1)$$

Where, F_Error is the forecast error, $SplitBS$ stands for our segment split variable of the business segments, $GranBS$ stands for the line item granularity of business segments, $PrftGap$ denotes the profitability gaps resulting from transaction allocation and non-GAAP accounting. In all our regressions, we control for industry and year fixed effects and include relevant control variables shown in prior literature to impact analysts' earnings forecast accuracy (Baldwin, 1984; Behn, Choi, & Kang, 2008; Hope, 2003). All metrics are explained in the following and in the appendix.

We calculate the forecast error at time t as:

$$F\_ERROR_{i,t} = \frac{\left|EPS_{i,t} - EPS\ Forecast_{i,t}\right|}{Price_{i,t}} \quad (2)$$

To address our first hypothesis (H1), we investigate the cross-sectional effect of the reported segment split, $SplitBS$, on the forecast error. We measure the degree of business activity aggregation in reported segments at time t by constructing an Herfindahl-Hirschman index based metric with respect to segment business revenue (Berger & Hahn, 2007; Kang, Khurana, & Wang, 2017). We calculate the index as the sum of the squared ratios of individual segment revenue to total firm revenue. Since the Herfindahl-Hirschman index is a concentration metric, we calculate $SplitBS$ then as ***one minus the*** *Herfindahl-Hirschman* index to emphasize the effect of splitting financial information into segments:

$$SplitBS_{i,t} = 1 - \sum_{j}^{n} \left(\frac{Business\ Segment\ Revenue_{i,j,t}}{Total\ Revenue_{i,t}} \right)^2 \quad (3)$$

Where:

n denotes the number of business segments of firm i at time t.

By construction, this metric will range from 0 to below 1, whereby firms with an increased breakdown of business activities, segment split, will score higher, while firms with a high degree of aggregation of business activities in few segments will score lower on the scale.

As mentioned in the previous section, we expect that the reported segment structure does not mirror actual firm diversification due to the discretionary segment split, income shifting between segments and internal management principles. We specifically control for actual diversification, to avoid that the effect captured by $SplitBS$ on the F_ERROR is in fact driven by actual firm diversification. Research suggests that more diversified firms have a higher segment split, reporting more segments (e.g., Kang et al., 2017). However, as a matter of this study, we think it makes sense to distinguish between segment split and diversification. The segment split is discretionary as of the perspective of the firms' management. Therefore, we control for diversification by counting the industry code based on the first two digits of the reported NAICS codes and implement dummy variables on this basis.

To address our second hypotheses (H2), we count the reported line items for each segment and then determine the number of line items each firm typically uses for the reporting of its segments. We find that the most representative number of line items that a firm "typically" uses is identified by the median of the line item count per segment for each firm in each year. We then benchmark this number of line items for each firm against the highest so observed value per year. The resulting metric, ranging from 0 to 1, serves as a means of differentiating companies with various degrees of line item disclosure, with higher values signaling increased number of line items. We calculate this metric for mandatory line items according to ASC 280 (compustat items: dps, esubs, ias, ivaeqs, nis, ops, revts) and for discretionary line items (all other compustat items in the business segment data set with non-missing values) separately.

We approach our third hypotheses (H3) by computing the profitability gap as a result of non-GAAP accounting in segment reports. $ROA\ Gap1$ is the "gap" between aggregated unlevered segment profitability and unlevered firm level profitability as obtained from the end of year financial statements. A similar approach can be found in Wang & Ettredge, 2015, Alfonso et al., 2012, or Hollie & Yu, 2012.

$$ROA\ Gap1_{i,t} = \left| aggROA1_{\ i,t} - ROA_{i,t} \right| \quad (4)$$

Where,

$$aggROA1_{i,t} = \frac{\sum_{j}^{n} Operating\ Income\ from\ Segments\ (after\ Tax)_{i,j,t}}{\sum_{j}^{n} Segment\ Assets_{i,j,t}} \quad (6)$$

And,

$$ROA_{i,t} = \frac{Operating\ Income\ (after\ tax) from\ Consolidated\ Financial\ Statememts\ _{i,t}}{Total\ Assets_{i,t}} \quad (7)$$

With *i=firm, j=segment, t=time period.*

We also compute the profitability gap as a levered metric $ROE\ Gap1$.

$$ROE\ Gap1_{i,t} = \left| aggROE1\ _{i,t} - ROE_{i,t} \right| \quad (8)$$

We reconstruct firm level return on equity from segment level return on assets as follows:

$$aggROE1\ _{i,t} = aggROA1_{i,t} + \frac{Total\ Debt}{Total\ Equity} \times \left(aggROA1_{i,t} - Net\ Borrowing\ Costs_{i,t} \right) \quad (9)$$

with n representing the number of segments of firm i at time t.

We use as a proxy for net borrowing costs (after taxes) the difference between operating income (before taxes) and net income (after tax) scaled by total debt:

$$Net\ Borrowing\ Costs_{i,t} = \frac{Operating\ Income\ (before\ taxes)\ _{i,t} - Net\ Income_{i,t}}{Total\ Debt_{i,t}} \quad (10)$$

Return on equity on firm level is calculated by:

$$ROE_{i,t} = \frac{Net\ Income_{i,t}}{Total\ Equity_{i,t}} \quad (11)$$

For our fourth hypothesis (H4), we calculate $ROA\ Gap2$, $ROA\ Gap2$ as well as a levered version of the gaps, $ROE\ Gap2$ and $ROE\ Gap3$, similarly as before for $ROE\ Gap1$. However, for $ROA\ Gap2$ we completely exclude all segment profitability components (segment operating income and segment assets) for those segments that do not report segment revenue or assets. For $ROA\ Gap3$ we completely excludes all segment profitability components (segment operating income and segment assets) for those segments that do not report segment revenue or assets or operating income. The difference between $ROA\ Gap2$ compared with $ROA\ Gap3$ comes then from

those segments that don't report assets but operating income, being excluded from aggregated segment profitability when generating $ROA\ Gap3$.

Controls

In line with accounting quality research, we control for earnings quality by including the accruals amount derived from the cash flow statement as a control variable in our regression model (Hribar & Collins, 2002). This is also in line with forecasting literature, which finds that analysts consistently take into account discretionary accruals when issuing earnings forecasts (Givoly, Hayn, & Yoder, 2011).

Analyst coverage is found to have a positive effect on earnings forecast accuracy (Huang, Pereira, & Wang, 2017). To account for this in our model, we control for the number of analysts' opinions that flow into the earnings forecast.

Volatile earnings are more difficult to forecast (Dichev & Tang, 2009). We calculate the 5-year earnings volatility for our sample and include it as an additional control in our models.

Larger firms are more likely to have increased press coverage and receive greater analyst attention (Kothari, Li, & Short, 2009). We use total revenue as a proxy for firm size and control for it throughout our analysis.

We control for leverage of firms, since research has shown that firms depending more heavily on external financing are willing to reveal more information about segment profitability differences (Ettredge et al., 2006).

All our models include firm parameters such as the ratio of accruals, number of analysts' estimates that contribute to the earnings forecast, the standard deviation of the past 5 years' earnings per share, while also controlling industry, year, diversification fixed effects and firm random effects. As a robustness check, we rerun our regressions controlling for firm fixed effects and find similar results.

4. Data

Our initial dataset contains 4,411 US listed firms covering the 8-year period from 2009 to 2016. We select 2009 as the starting year for our analysis, as it excludes the financial crisis, yet covers the period of internationally harmonized segment reporting (ASC 280 was adopted in substance by IFRS 8).

Due to the nature of our research question, we restrict our analysis to firms, reporting two or more business segments. We also eliminate firms with only 1 geographical segment and missing type of segment specification. Furthermore, we eliminate firms with missing data, negative book value of equity (since our analysis bases on calculations of also levered profitability gap) and

outliers (when the forecast error is greater than 800%). We drop firms which trade at a price below $1, for which no earnings forecast is available, those for which we cannot calculate the past 5 year's earnings standard deviation, or for which no segment level data exists (Akbas, Jiang, & Koch, 2017). The procedure and the firm count is presented in Table 1.

Our final sample results in 591 firms with 2,786 firm-year observations. To alleviate the survivorship bias, we do not require firms to have observations in all years, resulting in an unbalanced panel.

Table 1: Sample Selection

4,411 U.S.-listed firms (Compustat) – Initial Sample
1,918 – after dropping firms with less than 2 business segments
1,141 – after dropping firms with less than 2 geographical segments
1,137 – after dropping firms with missing type of segments
1,025 – after dropping penny stocks
1,007 – after dropping firms with negative book value
901 – after dropping outliers in terms of forecast error (F Error > 8)
894 – after dropping firms for which no analyst coverage exists
892 – after dropping firms which do not have 5-yr earnings history
885 – after dropping firms with missing accruals
606 – after dropping firms with no segment profitability metrics
598 – after dropping firms for which no total debt is disclosed
591 – after dropping extreme ROE values (ROE > 500%)
591 – Working Sample (2,786 Firm – Years)

Table 2. Descriptive Statistics

	Full Sample								2009			2010			2011			2012			2013			2014			2015			2016		
	n	m	sd	min	p25	p50	p75	max	n	m	sd	n	m	sd	n	m	sd	n	m	sd	n	m	sd	n	m	sd	n	m	sd	n	m	sd
F ERROR	2,790	0.051	0.132	0.000	0.007	0.019	0.044	3.878	284	0.095	0.280	324	0.042	0.073	343	0.041	0.087	384	0.057	0.138	387	0.037	0.068	386	0.036	0.077	363	0.075	0.155	319	0.037	0.059
F ERROR (Sign)	2,790	-0.033	0.138	-1.758	-0.035	-0.009	0.003	3.878	284	-0.051	0.291	324	-0.001	0.085	343	-0.016	0.095	384	-0.042	0.143	387	-0.024	0.074	386	-0.028	0.080	363	-0.066	0.159	319	-0.032	0.062
ROA Gap1	2,790	0.035	0.176	0.000	0.001	0.006	0.021	4.961	284	0.033	0.074	324	0.058	0.331	343	0.028	0.065	384	0.039	0.184	387	0.054	0.250	386	0.028	0.111	363	0.021	0.118	319	0.013	0.032
ROA Gap2	2,790	0.049	0.086	0.000	0.009	0.027	0.058	1.994	284	0.064	0.140	324	0.058	0.091	343	0.049	0.074	384	0.051	0.115	387	0.047	0.059	386	0.044	0.067	363	0.045	0.066	319	0.041	0.051
ROA Gap3	2,790	0.031	0.059	0.000	0.006	0.017	0.036	1.994	284	0.040	0.076	324	0.033	0.053	343	0.029	0.044	384	0.034	0.107	387	0.031	0.039	386	0.028	0.037	363	0.028	0.037	319	0.027	0.034
ROA Gap1 (Sign)	2,790	-0.019	0.178	-4.961	-0.009	0.000	0.004	0.770	284	0.006	0.081	324	-0.039	0.334	343	-0.014	0.070	384	-0.024	0.186	387	-0.038	0.252	386	-0.018	0.113	363	-0.013	0.119	319	-0.007	0.034
ROA Gap2 (Sign)	2,790	-0.037	0.092	-1.994	-0.053	-0.022	0.000	1.671	284	-0.021	0.153	324	-0.040	0.101	343	-0.041	0.079	384	-0.043	0.119	387	-0.037	0.066	386	-0.039	0.070	363	-0.039	0.070	319	-0.037	0.054
ROA Gap3 (Sign)	2,790	-0.020	0.063	-1.994	-0.031	-0.013	0.000	0.770	284	-0.008	0.085	324	-0.018	0.060	343	-0.021	0.049	384	-0.025	0.109	387	-0.021	0.046	386	-0.023	0.040	363	-0.023	0.041	319	-0.023	0.036
ROE Gap1	2,541	0.046	0.102	0.000	0.017	0.029	0.047	2.583	257	0.057	0.090	286	0.062	0.155	310	0.049	0.052	351	0.046	0.056	347	0.052	0.186	350	0.037	0.052	338	0.039	0.081	302	0.029	0.025
ROE Gap2	2,541	0.035	0.047	0.000	0.012	0.024	0.043	1.128	257	0.052	0.090	286	0.039	0.044	310	0.041	0.046	351	0.036	0.034	347	0.028	0.032	350	0.028	0.035	338	0.033	0.049	302	0.026	0.025
ROE Gap3	2,541	0.037	0.066	0.000	0.011	0.023	0.044	2.106	257	0.061	0.158	286	0.042	0.053	310	0.043	0.055	351	0.036	0.040	347	0.030	0.038	350	0.027	0.034	338	0.036	0.058	302	0.029	0.030
ROE Gap1 (Sign)	2,541	0.058	0.391	-8.138	0.023	0.057	0.109	5.089	257	0.076	0.204	286	0.020	0.558	310	0.089	0.336	351	0.035	0.474	347	0.007	0.429	350	0.059	0.364	338	0.096	0.391	302	0.086	0.199
ROE Gap2 (Sign)	2,541	0.059	0.233	-2.624	-0.003	0.039	0.091	4.909	257	0.055	0.210	286	0.058	0.151	310	0.075	0.308	351	0.056	0.243	347	0.044	0.133	350	0.059	0.208	338	0.070	0.333	302	0.053	0.198
ROE Gap3 (Sign)	2,541	0.030	0.236	-2.624	-0.027	0.023	0.075	4.235	257	0.034	0.248	286	0.023	0.182	310	0.043	0.276	351	0.029	0.247	347	0.021	0.148	350	0.029	0.229	338	0.039	0.315	302	0.025	0.194
SplitBS	2,790	0.519	0.195	0.000	0.421	0.532	0.666	0.916	284	0.502	0.198	324	0.504	0.204	343	0.519	0.208	384	0.537	0.197	387	0.528	0.191	386	0.529	0.190	363	0.523	0.184	319	0.501	0.188
SplitGS	2,790	0.467	0.227	0.000	0.300	0.491	0.657	1.000	284	0.457	0.222	324	0.459	0.233	343	0.470	0.234	384	0.475	0.226	387	0.473	0.225	386	0.475	0.231	363	0.456	0.229	319	0.467	0.216
GranBS_M	2,790	0.725	0.152	0.143	0.571	0.857	0.857	1.000	284	0.725	0.140	324	0.713	0.156	343	0.720	0.156	384	0.727	0.153	387	0.716	0.166	386	0.719	0.161	363	0.738	0.142	319	0.742	0.137
GranBS_D	2,790	0.427	0.119	0.000	0.368	0.421	0.474	1.000	284	0.312	0.125	324	0.399	0.110	343	0.428	0.109	384	0.441	0.103	387	0.444	0.106	386	0.448	0.114	363	0.454	0.110	319	0.464	0.115
GranGS_M	2,790	0.364	0.183	0.000	0.167	0.417	0.500	1.000	284	0.357	0.186	324	0.360	0.189	343	0.376	0.191	384	0.373	0.182	387	0.370	0.181	386	0.360	0.180	363	0.358	0.179	319	0.357	0.176
GranGS_D	2,790	0.331	0.075	0.000	0.276	0.345	0.345	1.000	284	0.299	0.091	324	0.322	0.079	343	0.344	0.085	384	0.339	0.074	387	0.333	0.064	386	0.334	0.067	363	0.338	0.067	319	0.334	0.065
ACCRUALS	2,790	0.040	0.026	0.001	0.026	0.035	0.047	0.360	284	0.042	0.027	324	0.039	0.027	343	0.041	0.033	384	0.039	0.026	387	0.038	0.025	386	0.038	0.024	363	0.039	0.022	319	0.040	0.025
NESTIMATES	2,790	0.215	0.154	0.020	0.098	0.176	0.314	0.882	284	0.193	0.134	324	0.206	0.152	343	0.214	0.154	384	0.213	0.150	387	0.218	0.156	386	0.219	0.154	363	0.226	0.163	319	0.223	0.158
EPS_STDEV	2,790	-0.080	1.174	-3.908	-0.841	-0.170	0.519	5.349	284	2.346	9.428	324	2.762	9.488	343	3.262	10.496	384	3.112	11.429	387	3.285	12.766	386	2.916	13.377	363	2.859	15.434	319	3.704	21.960
MARKET CAP	2,790	8,315	23,338	45	757	2,082	5,676	311,817	284	5,635	14,871	324	6,473	16,476	343	6,614	18,299	384	7,038	19,665	387	8,950	24,949	386	10,091	26,990	363	10,079	28,098	319	11,014	30,202
ASSETS	2,790	9,491	39,627	17	764	2,255	5,957	781,818	284	8,949	48,070	324	8,851	45,060	343	9,379	42,968	384	8,979	39,216	387	9,814	41,065	386	9,696	37,930	363	10,050	32,501	319	10,082	28,687
REVENUE	2,790	7,263	18,161	4	744	1,960	5,012	190,884	284	6,338	16,575	324	6,520	16,902	343	7,145	17,627	384	7,255	18,197	387	7,191	18,743	386	7,905	20,063	363	8,083	19,585	319	7,354	16,487
DEBT TO EQUITY	2,790	0.835	1.587	0.000	0.180	0.481	0.880	26.041	284	0.732	1.289	324	0.628	1.002	343	0.839	2.339	384	0.704	0.965	387	0.672	0.964	386	0.861	1.404	363	1.031	1.677	319	1.231	2.357
N SEGBUS	2,790	4.318	1.669	2.000	3.000	4.000	5.000	15.000	284	4.088	1.413	324	4.238	1.627	343	4.455	1.967	384	4.523	1.886	387	4.432	1.686	386	4.425	1.664	363	4.264	1.551	319	4.000	1.308
N SEGGEO	2,790	4.767	3.496	2.000	3.000	4.000	6.000	49.000	284	4.408	2.718	324	4.608	2.832	343	4.787	3.397	384	4.948	3.460	387	4.899	3.845	386	4.972	3.971	363	4.744	3.687	319	4.630	3.586
N NAICS BUS	2,790	4.007	2.029	1.000	3.000	4.000	5.000	17.000	284	3.880	2.061	324	3.978	2.124	343	3.980	2.214	384	4.065	2.119	387	4.013	1.968	386	4.075	1.973	363	4.058	1.934	319	3.959	1.831
N NAICS GEO	652	1.853	0.399	1.000	2.000	2.000	2.000	3.000	60	1.800	0.403	79	1.861	0.348	99	1.869	0.395	96	1.885	0.407	95	1.832	0.404	87	1.862	0.408	74	1.851	0.428	62	1.839	0.413

5. Empirical Results

Descriptive Statistics and Univariate Analysis

Table 2 reports the descriptive statistics of the full sample along with the correlation matrix in Table 3. For a complete description of our variables and data sources please refer to Table 7 in the appendix.

Forecast Error (denoted as delta earnings-to-price ratio)*:* The mean (median) absolute forecast error F_ERROR scaled by price in t is 0.051 (0.019). If the sign of the forecast error is considered, the mean (median) value of the forecast error of the F_ERROR $(Sign)$ is -0.033 (-0.009). Table 3 Panel A reveals that the standard deviation of 0.132 (and similar 0.138 for F_ERROR $(Sign)$) is primarily driven by the fifth quintile, which is the one with the largest forecast error. Quintiles 2-3 for the F_ERROR and F_ERROR $(Sign)$ indicate that a large portion of the *earnings-to-price ratio* of the firms in our sample might result from overly optimistic earnings forecasts, as actual EPS tend to undershoot analysts' expectations. Table 3, Panel A splits and ranks the different profitability gap variables according to the forecast error quintiles. We observe that the higher quintiles of F_ERROR correspond to higher mean (media) profitability gaps, suggesting that EPS forecast might be influenced by segment reports. However, the standard deviation of the profitability gaps are relatively high when the profitability gaps are split and ranked according the F_ERROR and F_ERROR $(Sign)$. The relationship is further analyzed in a multivariate setting (see section *regression analysis*).

Profitability Gap (between aggregated profitability from segments and firm profitability): The mean (median) absolute unlevered profitability gaps based on $ROA\ Gap1$, $ROA\ Gap2$, $ROA\ Gap3$ are 0.035 (0.006), 0.049 (0.027), 0.031 (0.017). The mean (median) levered profitability gaps based on on $ROE\ Gap1$, $ROE\ Gap2$, $ROE\ Gap3$ are 0.046 (0.029), 0.035 (0.024), 0.037 (0.023). If the sign is considered, the mean (median) unlevered profitability gaps based on $ROA\ Gap1$ $(Sign)$, $ROA\ Gap2$ $(Sign)$, $ROA\ Gap3$ $(Sign)$ and the mean (median) levered profitability gaps based on on $ROE\ Gap1$ $(Sign)$, $ROE\ Gap2$ $(Sign)$, $ROE\ Gap3$ $(Sign)$ are 0.019 (0.000), 0.037 (0.022), 0.020 (0.013) and 0.058 (0.057), 0.059 (0.039), 0.030 (0.023), respectively, which means that the aggregated profitability from segments is higher than the profitability from the consolidated financial statements, which suggests that if analysts rely too much on segments reporting their EPS estimates might overestimate the profitability of assets, equity as well as the firm's earnings. Again the standard deviation is high, further analysis is carried out in a multivariate setting (see section *regression analysis*).

Table 3, Panel B splits and ranks the unlevered profitability gap according to the forecast error when the sign of the forecast error F_ERROR $(Sign)$ additionally is taken into account, $ROA\ Gap1$ $(Sign)$, $ROA\ Gap2$ $(Sign)$, $ROA\ Gap3$ $(Sign)$. The quintiles suggest that too optimistic EPS estimates (negative sign) correspond to segment aggregated profitability being higher than consolidated profitability. Given the high standard deviations, we further analyze this relationship in a multivariate setting (see section *regression analysis*).

We report Spearman (Pearson) correlations in Table 5. The correlation between the absolute version of the forecast error $(F\_ERROR_{i,t})$ and the levered (ROE) profitability gap metrics is

(between 0.133 and 0.171), if the sign is also taking into account then the correlation is negative and between -0.204 and -0.247.

Segment Split: The mean (median) business segment split variable $SplitBS$ is 0.519 (0.532), while geographical segment split variable $SplitGS_{i,t}$ is 0.467 (0.491).

Line Item Granularity: The mean (median) business segment granularity covering mandatory $GranBS\_M$ and discretionary line items $GranBS\_D$ are 0.725 (0.857) and 0.427 (0.421), respectively. The mean (median) geographical segment granularity covering mandatory $GranGS\_M$ and discretionary line items $GranGS\_D$ are 0.364 (0.417) and 0.331 (0.345), respectively.

Number of segments and industries: The mean (median) number of business segments is N_SEGBUS is 4.318 (4.0) with a standard deviation of 1.669 and N_SEGGEO is 4.767 (4.0) with a standard deviation of 3.496. The mean (median) of NAICS per company for their business segments N_NAICS_BUS is 4.007 (4.0) with a standard deviation of 2.029 for their geographical segments N_NAICS_GEO 1.853 (2.0) with a standard deviation of 0.399.

Table 4 Panel A splits and ranks the segment split variables: $SplitBS$, $SplitGS$ and the line item granularity variables: $GranBS\_M$, $GranBS\_D$, $GranGS\_M$, and $GranGS\_D$ according to the forecast error quintiles F_ERROR. Based on the correlation tables and contrary to the common expectation that an increased split would increase valuable information on business activities and facilitate the forecast of earnings, we find no apparent relationship between these metrics, at least according to this analysis. A possible explanation might be that the increased segment split is actually reflecting more diversified firms and offsets the information value of a greater segment split. However, the number of NAICS, N_NAICS_BUS, is quasi constant throughout all quintiles, close to 4, with only a slight decrease in the mean and standard deviation when considering the 5 quintiles of F_ERROR. Moreover, the correlation matrix does not suggest a strong association between diversification and the forecast error, the correlation between the forecast error and the number of reported NAICS is negligibly low, as well as showing an inconclusive sign 0.049 (-0.059).

Segment split is often used as a proxy for (or confused with) diversification (e.g., Kang et al., 2017) despite the discretionary character of the actual segment split. To display the relationship between segment split, number of business segments and number of industries reported for business segments, Table 4, Panel B splits and ranks number of segments and the number of line items and NAICS against our segment split variable. Panel C of the same table shows the number of number of NAICS for business segments and the number of segments and segment split for the corresponding firms. It reveals that a striking 71.4 percent of the firms operate in 1, 2, 3 or 4 industries but report on average in all cases only about the same number of segments and the same segment split. In line with this, the increase in the average segment split from 0.209 to 0.538, as depicted in Panel B in Panel B of the quintiles 1 to 3 (60% of all firms) corresponds to 3-4 business segments and 3-3.5 NAICS.

Furthermore, when looking at the relation between the forecast error and the number of business segments, we find similar results, namely a correlation of -0.015 (0.001). Given a mean (median) of business segments and NAICS about 4, the correlation between the number of segments and the

number of NAICS is 0.653 (0.722); however, the correlation between segment split and NAICS of 0.107 (0.471) is substantially lower, supporting our understanding that it is important to distinguish between segment split and diversification.

The analysis in Table 4, Panel B also provides evidence that an increased number of segments results in a decrease number of reported line items when the segment split increases, particularly for the quintiles 4 and 5, which is in line with the finding in prior studies (Bugeja et al., 2015; Ettredge et al., 2006; Gotti, 2016). Also, when looking at the correlation table in Table 5, the segment split, mandatory and discretionary line items do seemingly not -0.039, -0.030, -0.023 (0.016, -0.030, 0.008) reduce the forecast error in this univariate setting.

Size: The mean (median) size in terms of market capitalization $MARKET\_CAP(\$MM)$ is 8,315 (2,082) with a standard deviation of 23,338, in terms of asset size $ASSETS(\$MM)$ is 9,491 (2,255) with a standard deviation of 39,627, and in terms of revenue $Revenue$ $(\$MM)$ is 7,263 (1,960) with a standard deviation of 18,161.

There is a slight negative correlation between the accounting quality variable (ACCRUALS) and the business segment split $SplitBS$ of -0.118 (-0.069). The higher the split, the lower the number of disclosed mandatory line items -0.150 (-.130). A similar picture is documented when looking at the negative correlation between the geographical segment split and mandatory line items granularity -.224 (-0.195), implying that an increased segment split is correlated with a reduction in line items (Bugeja et al., 2015; Ettredge et al., 2006; Gotti, 2016). Conversely, when looking at discretionary line items, the opposite can be observed.

Larger companies, as measured by market cap, total assets or revenue benefit from increased analyst coverage as evidences by correlations between 0.706 and 0.808 (0.297 and 0.462).

The forecast error positively correlates with standard deviation of last five years of EPS 0.212 (0.125). Despite existing findings regarding the impact of leverage on information availability (Dhaliwal, Hogan, Trezevant, & Wilkins, 2011), the debt-to-equity ratio does not correlate with the forecast error 0.040 (0.047), nor the segment split -0.039 (0.016) in this univariate setting.

Table 3: *Forecast Error and Levered and Unlevered Profitability Gaps*

Panel A

	F_ERROR			*ROA Gap1*		*ROA Gap2*		*ROA Gap3*		*ROE Gap1*		*ROE Gap2*		*ROE Gap3*	
Quintile	n	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
1	558	0.002	0.001	0.028	0.222	0.050	0.084	0.027	0.046	0.036	0.076	0.027	0.032	0.028	0.041
2	558	0.009	0.002	0.036	0.218	0.048	0.064	0.027	0.037	0.041	0.095	0.028	0.027	0.029	0.035
3	558	0.019	0.004	0.038	0.181	0.051	0.105	0.033	0.093	0.043	0.078	0.031	0.030	0.032	0.033
4	558	0.038	0.008	0.028	0.093	0.045	0.064	0.029	0.042	0.046	0.129	0.032	0.029	0.035	0.038
5	558	0.189	0.251	0.043	0.127	0.053	0.105	0.039	0.056	0.065	0.120	0.056	0.084	0.063	0.127
Total	2790	0.051	0.132	0.035	0.176	0.049	0.086	0.031	0.059	0.046	0.102	0.035	0.047	0.037	0.066

Panel B

	F_ERROR(Sign)			*ROA Gap1 (Sign)*		*ROA Gap2 (Sign)*		*ROA Gap3(Sign)*		*ROE Gap1 (Sign)*		*ROE Gap2 (Sign)*		*ROE Gap3 (Sign)*	
Quintile	n	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
1	558	-0.172	0.199	0.011	0.080	-0.012	0.115	-0.008	0.068	0.060	0.225	0.026	0.217	0.014	0.243
2	558	-0.028	0.008	-0.019	0.094	-0.037	0.062	-0.022	0.043	0.047	0.242	0.039	0.179	0.011	0.195
3	558	-0.009	0.004	-0.032	0.201	-0.050	0.114	-0.027	0.095	0.041	0.410	0.055	0.210	0.022	0.221
4	558	0.002	0.003	-0.023	0.221	-0.043	0.078	-0.022	0.045	0.087	0.457	0.089	0.257	0.056	0.251
5	558	0.045	0.170	-0.034	0.230	-0.044	0.074	-0.022	0.046	0.052	0.529	0.083	0.284	0.048	0.260
Total	2790	-0.033	0.138	-0.019	0.178	-0.037	0.092	-0.020	0.063	0.058	0.391	0.059	0.233	0.030	0.236

Table 4: *Forecast Error, Segment Split and Line Items Granularity*

Panel A

	F_ERROR			*SplitBS*		*SplitGS*		*GranBS_M*		*GranBS_D*		*GranGS_M*		*GranGS_D*		*SplitBS*		*N NAICS BUS*	
Quintile	n	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
1	558	0.002	0.001	0.530	0.195	0.467	0.223	0.733	0.150	0.439	0.118	0.317	0.157	0.207	0.052	0.530	0.195	4.172	2.179
2	558	0.009	0.002	0.518	0.196	0.457	0.221	0.725	0.151	0.424	0.110	0.312	0.155	0.201	0.041	0.518	0.196	4.199	2.302
3	558	0.019	0.004	0.518	0.197	0.483	0.223	0.728	0.156	0.419	0.112	0.314	0.155	0.198	0.041	0.518	0.197	3.973	1.914
4	558	0.038	0.008	0.515	0.202	0.465	0.235	0.718	0.156	0.425	0.121	0.317	0.157	0.200	0.045	0.515	0.202	3.927	1.973
5	558	0.189	0.251	0.514	0.185	0.462	0.234	0.720	0.149	0.428	0.131	0.302	0.159	0.195	0.046	0.514	0.185	3.763	1.696
Total	2790	0.051	0.132	0.519	0.195	0.467	0.227	0.725	0.152	0.427	0.119	0.312	0.157	0.200	0.045	0.519	0.195	4.007	2.029

Panel B

	SplitBS			*N SEGBUS*		*N NAICS BUS*		*GranBS_M*		*GranBS_D*		*GranGS_M*		*GranGS_D*	
Quintile	n	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
1	558	0.209	0.110	2.944	0.825	3.043	1.076	0.751	0.141	0.439	0.152	0.337	0.157	0.205	0.048
2	558	0.448	0.033	3.312	0.788	3.152	1.089	0.751	0.140	0.435	0.104	0.329	0.151	0.195	0.055
3	558	0.538	0.035	3.975	0.930	3.525	1.509	0.712	0.166	0.423	0.122	0.313	0.155	0.200	0.036
4	558	0.647	0.024	4.805	0.891	4.486	1.844	0.711	0.153	0.420	0.103	0.310	0.166	0.204	0.042
5	558	0.754	0.045	6.552	1.650	5.828	2.672	0.699	0.153	0.418	0.105	0.273	0.147	0.197	0.043
Total	2790	0.519	0.195	4.318	1.669	4.007	2.029	0.725	0.152	0.427	0.119	0.312	0.157	0.200	0.045

Panel C

	N NAICS BUS			*N SEGBUS*		*SplitBS*	
	Firms	Perc.	Cum.	m	sd	m	sd
1	95	3.4	3.4	3.621	0.121	0.455	0.022
2	480	17.2	20.6	3.567	0.060	0.435	0.008
3	765	27.4	48.0	3.566	0.042	0.448	0.007
4	653	23.4	71.4	4.044	0.050	0.499	0.007
5	296	10.6	82.0	5.091	0.065	0.610	0.008
6	185	6.6	88.7	5.627	0.105	0.659	0.009
7	139	5.0	93.7	5.957	0.092	0.699	0.008
8	78	2.8	96.5	5.705	0.141	0.681	0.009
9	40	1.4	97.9	7.225	0.233	0.698	0.023
10	27	1.0	98.9	7.481	0.386	0.767	0.010
11	16	0.6	99.4	8.938	0.536	0.808	0.019
12	5	0.2	99.6	8.800	0.200	0.833	0.020
13	2	0.1	99.7	9.500	0.500	0.851	0.005
14	2	0.1	99.8	10.500	0.500	0.854	0.010
15	4	0.1	99.9	10.750	0.250	0.864	0.010
16	1	0.0	99.9	9.000	.	0.819	.
17	2	0.1	100.0	15.000	0.000	0.916	0.001
Total	**2790**	**100**		**4.317**	**0.072**	**0.519**	**0.008**
	Sub Group of *N NAICSBUS* 1 to 4:			3.726	0.053	0.462	0.008
	Sub Group of *N NAICSBUS* 5 to 17:			5.794	0.119	0.662	0.010

Table 5: Correlation Matrix

Correlation Coefficients

	F ERROR	F ERROR (Sign)	ROA Gap1	ROA Gap2	ROA Gap3	ROA Gap1 (Sign)	ROA Gap2 (Sign)	ROA Gap3 (Sign)	ROE Gap1	ROE Gap2	ROE Gap3	ROE Gap1 (Sign)	ROE Gap2 (Sign)	ROE Gap3 (Sign)	SplitBS	SplitGS
F ERROR	1	**-0.336**	0.028	**0.074**	**0.115**	**0.069**	**0.138**	**0.117**	**0.117**	**0.302**	**0.250**	0.006	-0.035	-0.010	0.016	0.005
F ERROR (Sign)	**-0.573**	1	-0.026	**-0.068**	**-0.111**	**-0.068**	**-0.145**	**-0.123**	**-0.104**	**-0.269**	**-0.221**	-0.009	0.018	-0.009	-0.025	-0.021
ROA Gap1	**0.188**	**-0.165**	1	**0.398**	**0.486**	**-0.930**	**-0.110**	**-0.204**	**0.709**	**0.227**	**0.183**	**-0.738**	**-0.049**	-0.033	**0.048**	0.008
ROA Gap2	0.031	0.032	**0.314**	1	**0.781**	**-0.216**	**-0.521**	**-0.480**	**0.216**	**0.342**	**0.599**	**-0.160**	**-0.176**	**-0.301**	0.027	0.012
ROA Gap3	**0.088**	-0.057	**0.473**	**0.885**	1	**-0.354**	**-0.462**	**-0.621**	**0.305**	**0.447**	**0.433**	**-0.285**	**-0.267**	**-0.291**	**0.055**	0.025
ROA Gap1 (Sign)	0.033	-0.050	**-0.118**	**-0.217**	**-0.201**	1	**0.467**	**0.535**	**-0.612**	**-0.051**	-0.021	**0.773**	**0.097**	**0.096**	**-0.044**	-0.018
ROA Gap2 (Sign)	**0.097**	**-0.153**	**-0.117**	-0.778	**-0.625**	**0.234**	1	**0.804**	**0.071**	**0.130**	**0.141**	**0.163**	**0.301**	**0.529**	-0.021	**-0.039**
ROA Gap3 (Sign)	0.069	**-0.088**	**-0.122**	**-0.671**	**-0.694**	**0.336**	**0.893**	1	0.035	**0.092**	**0.053**	**0.277**	**0.435**	**0.497**	-0.037	**-0.048**
ROE Gap1	**0.133**	0.018	**0.210**	0.059	0.036	**0.204**	**0.123**	**0.199**	1	**0.690**	**0.548**	**-0.438**	**0.045**	**0.067**	0.037	-0.023
ROE Gap2	**0.129**	-0.030	**0.166**	0.049	0.042	**0.144**	**0.152**	**0.212**	**0.513**	1	**0.790**	-0.008	**0.093**	**0.122**	0.035	-0.031
ROE Gap3	**0.171**	**-0.092**	**0.191**	**0.181**	**0.209**	0.0527	0.025	0.035	**0.391**	**0.773**	1	-0.013	0.030	**0.050**	0.013	**-0.043**
ROE Gap1 (Sign)	**-0.240**	**0.240**	**-0.212**	-0.066	**-0.182**	**0.450**	**0.185**	**0.334**	**0.464**	**0.291**	**0.156**	1	**0.833**	**0.682**	-0.017	-0.014
ROE Gap2 (Sign)	**-0.236**	**0.243**	**-0.168**	**-0.337**	**-0.457**	**0.317**	**0.474**	**0.631**	**0.445**	**0.335**	**0.097**	**0.495**	1	**0.903**	0.012	-0.018
ROE Gap3 (Sign)	**-0.204**	**0.162**	**-0.153**	**-0.537**	**-0.512**	**0.334**	**0.676**	**0.693**	**0.385**	**0.337**	**0.100**	**0.430**	**0.928**	1	0.005	-0.021
SplitBS	-0.039	0.033	0.069	0.011	0.0311	-0.081	-0.051	-0.074	0.022	-0.053	-0.046	-0.014	0.001	0.001	1	**0.140**
SplitGS	0.001	-0.014	**0.084**	-0.027	-0.038	**-0.099**	-0.010	-0.023	-0.054	-0.059	**-0.083**	-0.005	0.039	0.043	**0.165**	1
GranBS_M	-0.030	0.047	0.018	**0.139**	**0.132**	**0.094**	**-0.124**	**-0.106**	-0.071	**-0.088**	**-0.085**	0.0183	**-0.103**	**-0.109**	**-0.150**	**-0.224**
GranBS_D	-0.023	0.009	**-0.109**	0.048	0.054	-0.064	**-0.109**	**-0.138**	-0.021	-0.058	-0.039	0.0203	-0.045	-0.06	**-0.129**	**-0.139**
GranGS_M	0.039	-0.004	-0.051	-0.023	-0.023	0.081	-0.022	-0.020	-0.046	**-0.130**	**-0.138**	-0.064	**-0.119**	**-0.098**	-0.070	**-0.201**
GranGS_D	-0.069	0.063	**-0.147**	-0.060	**-0.082**	0.077	-0.006	0.021	**0.091**	-0.011	-0.040	**0.152**	**0.097**	0.057	-0.031	**0.086**
ACCRUALS	**0.146**	**-0.206**	0.058	0.0558	0.053	0.011	-0.019	0.008	-0.034	-0.014	0.008	**-0.104**	**-0.156**	**-0.159**	**-0.118**	**-0.102**
NESTIMATES	**-0.186**	0.0603	0.044	-0.003	-0.057	**-0.115**	-0.004	0.012	0.043	0.059	0.068	**0.180**	**0.208**	**0.156**	**0.212**	**0.286**
EPS_STDEV	**0.212**	-0.078	**0.110**	**0.097**	**0.096**	**-0.140**	**-0.102**	**-0.097**	0.048	**0.104**	**0.130**	**-0.111**	**-0.107**	**-0.121**	**0.092**	0.074
MARKET CAP	**-0.349**	**0.203**	0.069	0.014	-0.047	**-0.140**	-0.051	-0.011	0.040	0.027	-0.025	**0.257**	**0.293**	**0.236**	**0.166**	**0.384**
ASSETS	**-0.151**	**0.084**	0.080	-0.067	**-0.108**	**-0.130**	0.042	0.064	**0.194**	**0.146**	**0.102**	**0.241**	**0.294**	**0.261**	**0.176**	**0.360**
REVENUE	**-0.197**	**0.140**	0.080	0.008	-0.054	**-0.125**	-0.024	0.024	**0.271**	**0.158**	**0.095**	**0.323**	**0.356**	**0.285**	**0.160**	**0.282**
DEBT TO EQUITY	0.040	**-0.091**	0.007	-0.054	-0.065	-0.008	0.015	0.046	**0.206**	**0.158**	**0.167**	**0.324**	**0.213**	**0.163**	0.023	0.025
N SEGBUS	-0.015	**0.120**	0.143	**0.163**	**0.162**	**-0.112**	**-0.198**	**-0.183**	0.035	-0.032	-0.024	0.001	-0.019	-0.057	**0.653**	**0.144**
N SEGGEO	0.057	**-0.089**	**0.104**	0.012	-0.041	**-0.115**	-0.048	-0.013	**-0.089**	-0.036	-0.056	**-0.106**	-0.035	-0.051	**0.194**	**0.727**
N NAICS BUS	0.049	-0.060	0.044	**-0.085**	**-0.122**	**-0.107**	0.015	0.049	-0.060	**-0.123**	**-0.099**	-0.047	-0.008	-0.030	**0.107**	0.068
N NAICS GEO	-0.035	-0.024	-0.010	-0.018	-0.073	-0.080	-0.029	0.023	-0.079	**-0.084**	-0.054	-0.060	-0.003	-0.040	-0.010	0.077

Spearman (Pearson) correlations are below (above) the diagonal.
Bold entries denote significance at $p < 0.05$

Table 5: Correlation Matrix (continued)

Correlation Coefficients

	GranBS_M	GranBS_D	GranGS_M	GranGS_D	ACCRUALS	NESTIMATES	EPS_STDEV	MARKET CAP	ASSETS	REVENUE	DEBT TO EQUITY	N SEGBUS	N SEGGEO	N NAICS BUS	N NAICS GEO
F ERROR	-0.030	0.008	-0.021	-0.034	0.139	**-0.064**	**0.125**	**-0.075**	-0.031	**-0.047**	**0.047**	0.001	**0.043**	**-0.059**	0.001
F ERROR (Sign)	0.003	-0.020	-0.007	**0.038**	**-0.123**	0.014	**0.085**	**0.048**	0.017	0.032	**-0.037**	-0.014	**-0.066**	**0.038**	-0.004
ROA Gap1	**-0.122**	-0.022	-0.033	-0.025	-0.018	**0.045**	-0.004	0.014	0.002	0.021	-0.002	**0.101**	-0.003	**0.039**	0.013
ROA Gap2	-0.003	**-0.071**	0.006	**-0.061**	0.018	0.035	0.006	-0.009	-0.027	**-0.049**	**-0.046**	**0.051**	0.009	-0.029	-0.028
ROA Gap3	-0.010	-0.033	0.001	**-0.084**	**0.044**	-0.006	0.006	-0.016	-0.021	**-0.042**	-0.019	**0.091**	0.031	-0.018	-0.044
ROA Gap1 (Sign)	**0.129**	0.008	**0.044**	0.004	0.029	**-0.053**	0.001	-0.022	0.001	-0.031	-0.002	**-0.095**	-0.002	**-0.048**	-0.020
ROA Gap2 (Sign)	-0.028	0.013	-0.014	0.001	0.019	-0.020	-0.015	0.001	0.032	0.031	0.028	**-0.040**	-0.001	0.006	-0.063
ROA Gap3 (Sign)	-0.001	-0.016	0.006	0.024	-0.001	0.013	-0.017	0.015	**0.042**	0.033	0.011	**-0.058**	-0.025	0.023	0.024
ROE Gap1	**-0.111**	**-0.045**	-0.021	-0.012	-0.021	0.029	0.002	-0.001	0.034	**0.062**	0.023	0.106	-0.018	**0.052**	-0.027
ROE Gap2	**-0.071**	**-0.069**	**-0.044**	**-0.063**	**0.040**	0.032	0.001	0.016	**0.076**	**0.095**	**0.049**	**0.064**	0.002	0.018	**-0.083**
ROE Gap3	**-0.041**	**-0.064**	-0.020	**-0.071**	**0.052**	0.020	-0.001	-0.003	**0.061**	**0.045**	0.029	0.038	-0.006	-0.016	**-0.104**
ROE Gap1 (Sign)	**0.071**	0.020	-0.002	0.028	-0.022	0.018	-0.011	0.038	0.029	0.035	**0.208**	**-0.054**	-0.019	-0.022	-0.062
ROE Gap2 (Sign)	**-0.068**	0.024	**-0.066**	**0.040**	**-0.091**	**0.112**	-0.028	**0.098**	**0.068**	**0.117**	**0.354**	0.004	**-0.056**	**0.039**	-0.043
ROE Gap3 (Sign)	**-0.073**	**0.039**	**-0.066**	0.030	**-0.095**	**0.090**	-0.027	**0.087**	**0.055**	**0.117**	**0.281**	0.001	**-0.045**	0.028	**-0.082**
SplitBS	**-0.130**	**-0.072**	**-0.129**	-0.026	**-0.069**	**0.141**	0.011	**0.162**	**0.134**	**0.041**	0.024	**0.722**	**0.083**	**0.471**	-0.001
SplitGS	**-0.135**	**-0.089**	**-0.195**	**0.041**	**-0.076**	**0.115**	-0.002	**0.093**	**0.046**	-0.005	-0.019	**0.069**	**0.464**	0.035	**0.085**
GranBS_M	1	**0.207**	**0.623**	0.008	**-0.057**	**-0.218**	0.011	**-0.102**	**-0.122**	**-0.158**	**-0.047**	**-0.186**	-0.032	**-0.078**	0.028
GranBS_D	**0.324**	1	0.034	**0.148**	0.026	**-0.043**	-0.016	-0.007	-0.013	-0.035	0.035	**-0.073**	**-0.082**	-0.010	**0.092**
GranGS_M	**0.632**	0.033	1	**0.147**	-0.021	**-0.265**	0.022	**-0.133**	**-0.126**	**-0.182**	**-0.056**	**-0.178**	**-0.145**	**-0.106**	-0.010
GranGS_D	0.005	**0.119**	0.071	1	**-0.053**	0.034	-0.020	0.019	-0.031	0.035	-0.001	-0.002	**-0.166**	0.0351	-0.026
ACCRUALS	0.042	0.001	0.053	0.001	1	-0.005	0.012	**-0.070**	**-0.061**	**-0.087**	**0.179**	**-0.046**	-0.029	**-0.137**	0.057
NESTIMATES	**-0.309**	**-0.088**	**-0.353**	0.036	**-0.128**	1	**-0.080**	**0.456**	**0.297**	**0.462**	**0.055**	0.157	0.015	**0.166**	0.064
EPS_STDEV	**-0.089**	0.031	0.030	0.012	0.023	-0.008	1	**-0.037**	-0.024	-0.035	-0.013	-0.008	-0.024	**-0.037**	0.020
MARKET CAP	**-0.277**	-0.064	**-0.343**	**0.106**	**-0.181**	**0.808**	-0.016	1	**0.769**	**0.708**	**0.060**	0.223	0.011	**0.351**	0.043
ASSETS	**-0.326**	-0.041	**-0.370**	**0.120**	**-0.166**	**0.774**	**0.094**	**0.916**	1	0.687	**0.091**	0.232	0.005	**0.358**	0.036
REVENUE	**-0.290**	-0.065	**-0.326**	**0.177**	**-0.150**	**0.706**	**0.110**	**0.855**	**0.907**	1	**0.057**	0.186	-0.035	**0.337**	0.058
DEBT TO EQUITY	**-0.121**	0.046	**-0.117**	0.043	**0.103**	**0.092**	0.065	**0.127**	**0.257**	**0.221**	1	0.003	**-0.037**	0.030	0.026
N SEGBUS	**-0.131**	**-0.153**	**-0.096**	-0.028	-0.076	**0.167**	0.070	**0.185**	**0.165**	**0.176**	0.004	1	**0.062**	**0.630**	0.022
N SEGGEO	**-0.163**	-0.075	**-0.199**	-0.081	-0.034	**0.303**	**0.091**	**0.299**	**0.267**	**0.223**	-0.075	**0.148**	1	0.009	**0.094**
N NAICS BUS	-0.006	0.027	0.016	-0.062	**0.178**	**0.106**	0.013	0.039	0.048	0.061	0.028	**0.166**	**0.139**	1	**0.467**
N NAICS GEO	0.040	**0.103**	0.013	-0.041	**0.100**	**0.094**	0.043	0.061	0.062	0.041	0.004	0.044	**0.123**	**0.592**	1

Spearman (Pearson) correlations are below (above) the diagonal.
Bold entries denote significance at $p < 0.05$

Table 6: Regression Analysis

Panel A: ***Regression of Forecast Error on Profitability Gaps, Segment Split, Line Item Granularity***

	Excluding incomplete segments when aggregating segment profitability								*PrftGap from non-Gaap accounting*					
	Gap2 *exludes all segments without Revenue or Assets*						***Gap3*** *excludes all segments without assets, revenue or operating income*				***Gap1*** *no exclusion of any segments.*					
	Gap2 (unlevered, ROA)			Gap2 (levered, ROE)			Gap3 (unlevered, ROA)			Gap3 (levered, ROE)				Gap1 (unlevered, ROA)			Gap1 (levered, ROE)		
Independent Variable	**Coeff**	**RSE**	**t**	**Coeff**	**RSE**	**t**	**Coeff**	**RSE**	**t**	**Coeff**	**RSE**	**t**		**Coeff**	**RSE**	**t**	**Coeff**	**RSE**	**t**
Business Segment Variables																			
PrftGap	0.170 **	0.068	2.51	0.797 ***	0.123	6.50	0.252 *	0.151	1.67	0.445 ***	0.160	2.79		0.027	0.017	1.63	0.130 *	0.069	1.89
SplitBS	0.044 ***	0.012	3.71	0.032 ***	0.012	2.63	0.040 ***	0.012	3.39	0.038 ***	0.012	3.04		0.042 ***	0.012	3.61	0.043 ***	0.013	3.20
GranBS_M	-0.040 *	0.020	-1.93	-0.020	0.022	-0.89	-0.038 *	0.021	-1.86	-0.026	0.022	-1.16		-0.034	0.021	-1.60	-0.022	0.024	-0.92
GranBS_D	0.066 *	0.035	1.89	0.068 *	0.039	1.74	0.063 *	0.035	1.79	0.065	0.040	1.63		0.061 *	0.035	1.75	0.060	0.040	1.50
Controls																			
ACCRUALS	0.586 ***	0.200	2.93	0.538 **	0.228	2.35	0.559 ***	0.199	2.81	0.567 **	0.233	2.43		0.574 ***	0.200	2.87	0.625 ***	0.231	2.70
NESTIMATES	0.185 ***	0.037	5.03	0.156 ***	0.040	3.92	0.185 ***	0.037	5.06	0.164 ***	0.040	4.06		0.187 ***	0.036	5.11	0.190 ***	0.039	4.83
EPS_STDEV	0.013 ***	0.005	2.61	0.012 **	0.006	2.24	0.013 ***	0.005	2.62	0.013 **	0.005	2.43		0.013 ***	0.005	2.59	0.014 **	0.006	2.44
SIZE	-0.038 ***	0.004	#####	-0.034 ***	0.004	-9.04	-0.037 ***	0.004	#####	-0.036 ***	0.004	-8.97		-0.038 ***	0.004	#####	-0.039 ***	0.004	#####
DEBT TO EQUITY	0.004 ***	0.002	2.75	0.003 *	0.001	1.81	0.004 ***	0.002	2.67	0.003 **	0.001	2.19		0.004 **	0.001	2.45	0.003 **	0.001	2.14
SplitGS	0.047 ***	0.016	2.87	0.049 ***	0.018	2.66	0.043 ***	0.016	2.65	0.052 ***	0.018	2.84		0.045 ***	0.016	2.74	0.049 ***	0.018	2.70
Diversification	Yes			Yes			Yes			Yes				Yes			Yes		
Year Fixed Effects	Yes			Yes			Yes			Yes				Yes			Yes		
Industry Fixed Effects	Yes			Yes			Yes			Yes				Yes			Yes		
R-squared	0.10			0.17			0.10			0.14				0.08			0.10		
Observations	2,790			2,541			2,790			2,541				2,790			2,541		
No. Of Groups	592			548			592			548				592			548		
Panel B: ***Regression coefficients for subsamples of positive and negative sign of the PrftGap variable***																			
PrftGap (positive)	-0.627 **	0.291	-2.15	-0.067 *	0.038	-1.75	-1.301 ***	0.132	-9.83	-0.094 **	0.045	-2.08		0.027	0.017	1.63	0.130 *	0.069	1.89
R-squared	0.38			0.12			0.46			0.15				0.08			0.10		
Observations	629			1,876			751			1,610				2,790			2,541		
No. Of Groups	276			459			316			423				592			548		
PrftGap (negative)	-0.020	0.025	-0.81	0.061	0.055	1.10	0.012	0.024	0.49	0.005	0.033	0.16		0.001	0.004	0.17	-0.017	0.013	-1.33
R-squared	0.06			0.15			0.06			0.13				0.19			0.31		
Observations	2,161			665			2,039			931				1,437			408		
No. Of Groups	526			255			517			315				483			195		

*, **, *** Denote significance at p < 0.10, < 0.05, and < 0.01, respectively.

Regression Analysis

Table 6 depicts the results of our regression analysis. Panel A and Panel B of Table 6 document and quantify the effect of the profitability gaps on the forecast error. All of the 4 regressions address the relationship between the profitability gap from "no-full-story" segments, i.e. segments that do not report revenue or assets: ROA_Gap2, ROE_Gap2, or segments lacking revenue, assets or operating income: ROA_Gap3 and ROE_Gap3 and its effect on the forecast error. We find and document a statistically significant (coefficient for the levered metric is 0.797 for ROE_Gap2) positive association with the forecast error. This comes to support our fourth hypothesis (H4). This finding suggests that analysts' earnings forecasts are biased towards firm profitability as derived from segments for which a complete set of profitability-related data items (assets, revenues or operating earnings) is disclosed. This finding is significantly tied to the amount and even the sign of the earnings forecast error–statistically and economically significant coefficients of $PrftGap(positive)$, r-squared of 0.46, in Panel B of Table 6.

It suggests that the attention of analysts might be directed to those segments where performance metrics are readily available. Findings are in line with prior research that shows that the discretion of segment reports and usefulness of actual segment data is exploited by management, suggesting that companies manage segment profitability through the allocation of business activities when aggregating them into reported segments (Berger & Hann, 2007) and intersegment income shifting (Lail et al., 2014; You, 2014).

Given the lack of a complete reconciliation requirement between aggregated segments and firm level reporting as well as the leeway provided by the low reporting requirements, coupled with the internal measurement principle, we tested if the existence of a discrepancy between segment aggregated profitability and firm level profitability explains the forecast error ROA_Gap1, ROE_Gap1. However, the evidence for a profitability gap that results from non-GAAP accounting (internal recognition and measurement principles for reported segments in contrast to the U.S.-GAAP for consolidated financial statements) is weak and only supporting H3 for the levered metric, ROE_Gap1. This could result from the firms using external accounting principles for their internal and segment reportings, facilitating the preparation of segment reporting and internal reports as it is readily available (Crawford, Extance, Hellier, & Power, 2012; Nichols, Street, & Cereola, 2012).

Throughout all of our different regression settings we find statistically significant evidence that the segment split is positively associated with the forecast error. To make sure that the findings are not driven by the level of firm diversification, we control for firm diversification by creating dummies for the number of business NAICS of a firm. The finding directly supports our first hypothesis (H1) and strengthens the idea that an increased segment split under the loose and permissive regulatory framework in defining and aggregating business activities into reporting business segments does not serve as a catalyst for forecasting purposes.

We also find that the mandatory line item granularity (H2) is negatively associated with (reducing) the forecast error, while the discretionary disclosure is increasing the forecast error, given the coefficients of $GranBS\_M$ and $GranBS\_D$ variables. This again suggests that the leeway and discretion might be impeding the work of outside analysts, resulting in less accurate forecasts.

6. Conclusion

Indisputably, segment reporting is a powerful tool for the firm in its communication with analysts and investors. However, segment reporting provides valuable information if it reliably reveals current performance of major business activities. In so doing, it provides a benchmark for the future guidance of the firm's management and it assists analyst in their forecasts and investors in their investment decision-making. Poor segment reporting, in turn, bears the risk of misinforming analysts and investors.

In this study, we argue, that discretion with regard to the segment split, allocation and granularity of segment data, coupled with shortcomings in matching and reconciling segment data with data from primary financial statements, impedes the analysis of reported segments and hence the evaluation of the company's prospects. In particular, overreliance by analysts on the (incomplete) data presented for segments bears the risk of resulting in a systematic forecast error, while the lack of key line items amplifies the discretionary nature of segment reporting.

Under ASC 280 (SFAS 131) and similarly IFRS 8, segment reporting aims at presenting financial information disaggregated into reporting segments, with the goal of enabling users to analyze individual business activities of the company and evaluate its prospects as a whole (ASC 280-10-1, IFRS 8.1). This is in line with research that suggests that disclosure on individual business activities (aggregated in segments) leads to an increased permeability of earnings forecasts into stock returns (Ettredge et al., 2005) and contributes to market efficiency in general (Hossain, 2008; Park, 2011).

With this study, we contribute to the existing segment reporting literature by investigating the usefulness of segment reporting with respect to EPS forecasting and EPS forecast accuracy. We address this question by a bottom up approach, aiming to reconcile firm level profitability by aggregating individual segment level profitability.

We provide evidence that there is a positive association between segment reporting profitability and earnings forecasts accuracy, which suggests that analysts might be biased in their earnings forecast. We document a statistically (and economically) significant relationship between the identified discrepancy and the forecast error, also when considering the sign of the error. We show the existence of a profitability gap between segment-aggregated profitability and (consolidated) firm level profitability and provide evidence that this gap is positively associated with the analysts' earnings per share forecast error. In particular, our findings suggest that the "full-story" segments drive the forecast error. Analysts will potentially use the segment data as input in their models to forecast segment and then firm profitability. However, in contrast to prior literature that finds that the non-GAAP measurement "gap" between segment and consolidated statements affects stock returns (Wang & Ettredge 2015, Alfonso, Hollie, & Yu, 2012), we don't find a statistically significant effect of the use of non-GAAP measures for segment reporting on the accuracy of forecasted EPS.

Our findings suggest that analyst forecasts might be influenced by the firms' allocation & measurement of segment data, the reported line item granularity and segment split, which directs

analyst attention primarily to those segments that allow for profitability calculations, leaving out segments, which do not report components of profitability metrics.

We also find that companies with less segments have a lower forecast error–after controlling for the level of firm diversification. Indeed, low segment split company forecasts are even more accurate when the discrepancy of segment and consolidated profitability is high, indication that analysts might ignore segment data when a mismatch is obvious. Hence, an increased segment split is not associated with a lower forecast error. Greater disaggregation across reported segments is not helping analysts in their exercise of forecasting earnings. This finding suggests that the split of firm level data into reported segment data does not correspond to individual business activities and their idiosyncratic risk characteristics and therefore systematically contributes to the analyst forecast error. It also suggests that granularity of line item disclosure and the leeway to shuffle relevant line item information between segments play a key role in the assessment of the firm's business activities.

Our findings are in line with previous research that finds that current segment reporting fails to provide an adequate split according to a diversified firm`s individual business profitability, risk and growth dimensions. We attribute our findings to the reporting requirements of segment data under the "management approach". This includes (1) reporting financial data that is used for internal management purposes and that may not be fully or at all be in line with GAAP coupled with little to no reconciliation needs, (2) aggregation of business activities to reportable segments based on the management's internal view, and (3) aggregation and reallocation of assets, costs and sales if justified by internal reporting principles without any transparency or consistency requirements.

Discretionary disaggregation coupled with limited disclosure of key line items (such as a breakdown between operating and financial assets) do not facilitate an accurate understanding, i.e. a breakdown of current profitability into its core drivers which serve as a basis for forecasting future profitability. Furthermore, the discretionary character of segment reports is amplified by the fact that reported segment data under both standards, US-GAAP and IFRS, is neither required to match with data provided in primary financial statements, nor is a full reconciliation required that tracks segment data mismatches back on the line item of financial statements. As a result, segment reporting lacks important information that is necessary for profitability analysis and forecasting. Nevertheless, the analyst's exercise of analyzing segment profitability to understand a company's risk, return and growth characteristics with the ultimate aim of forecasting sustainable future earnings requires a clear view on core profitability metrics from the business activities and their development, as well as an understanding of the underlying accounting.

We interpret this result as triggering evidence for the fact that the status quo of segment reporting falls short of disclosing vital information, which is relevant for analysts in their forecasting of future earnings. Surpassed in terms of disclosure amount and scope by end of year reporting, which offers a relatively good basis for assessing profitability, growth and risk, segment reporting falls short of delivering the vital value added needed by analysts when forecasting future earnings. Consequently, we see that for firms whose consolidated end of year reported numbers, disclosed in the more detailed firm level reporting and therefore closely resembling those of the concentrated segment, forecast errors are lower.

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Table 7: List of variables and variable description

F ERROR	The absolute of the difference between the earnings per share before extraordinary items as reported by the firm (Compustat Fundamental Database) and the forecasted earnings per share before extraordinary items for T as of T-1 (Thomson Reuters I/B/E/S Database) scaled by the market share price at the end of fiscal year T (Baldwin, 1984; Behn, Choi, & Kang, 2008; Dhaliwal, Radhakrishnan, Tsang, & Yang, 2012; O. K. Hope, 2003).	$F\_ERROR_{i,t} = \frac{\lvert EPS_{i,t} - EPS\ Forecast_{i,t} \rvert}{Price_{i,t}}$ (2)
F ERROR (Sign)	The difference between the earnings per share before extraordinary items as reported by the firm (Compustat Fundamental Database) and the forecasted earnings per share before extraordinary items for T as of T-1 (Thomson Reuters I/B/E/S Database) scaled by the market share price at the end of fiscal year T (Baldwin, 1984; Behn, Choi, & Kang, 2008; Dhaliwal, Radhakrishnan, Tsang, & Yang, 2012; O. K. Hope, 2003).	$F\_ERROR(Sign)_{i,t} = \frac{EPS_{i,t} - EPS\ Forecast_{i,t}}{Price_{i,t}}$ (17)
ROA Gap1	The absolute of the difference between the return on assets as derived from the company`s business segments (Compustat Segment Database) and return on common equity as derived from company`s financial statements (Compustat Fundamental Database) scaled by the market share price at the end of fiscal year T (Compustat Funadamental Database). The metric is calculated with respect to year T. This metrcis contains the difference due to non-gaap accounting in segment reports.	$ROA\ Gap1_{i,t} = \lvert aggROA1_{i,t} - ROA_{i,t} \rvert$ (4) Where, $aggROA1_{i,t} = \frac{\sum_j^n Operating\ Income\ from\ Segments\ (after\ Tax)_{i,j,t}}{\sum_j^n Segment\ Assets_{i,j,t}}$ (6) And, $ROA_{i,t} = \frac{Operating\ Income\ (after\ Tax) from\ Consolidated\ Financial\ Statememts_{i,t}}{Total\ Assets_{i,t}}$ (7) With *i=firm, j=segment, t=time period*
ROA Gap2	Same metric as ROA Gap1, but completely excludes all segment metrics (segment operating income and segment assets) for those segments that do not report segment revenue or assets.	
ROA Gap3	Same metric as ROA Gap1, but completely excludes all segment metrics (segment operating income and segment assets) for those segments that do not report segment revenue, assets, or operating income.	
ROA Gap1 (Sign)	Same metric as ROA Gap 1 but taking into account the direction (+/-) of the profitability gaap.	$ROA\ Gap1_{i,t} = aggROA1_{i,t} - ROA_{i,t}$ (18)
ROA Gap2 (Sign)	Same metric as ROA Gap 1 (sign) based on *aggROA2*, taking into account the direction (+/-) of the profitability gaap.	
ROA Gap3 (Sign)	Same metric as ROA Gap 1 (sign) based on *aggROA3* taking into account the direction (+/-) of the profitability gaap.	

Table (continued)

ROE Gap1	Levered version of ROA Gap 1.	$$ROE\ Gap1_{i,t} = \left|aggROE1_{i,t} - ROE_{i,t}\right| \quad (8)$$ with: $$aggROE_{i,t} = aggROA_{i,t} + \frac{Total\ Debt}{Total\ Equity} \times \left(aggROA_{i,t} - Net\ Borrowing\ Costs_{i,t}\right) \quad (9),$$ $$Net\ Borrowing\ Costs_{i,t} = \frac{Operating\ Income\ (before\ Tax)_{i,t} - Net\ Income_{i,t}}{Total\ Debt_{i,t}} \quad (10)$$ and $$ROE_{i,t} = \frac{Net\ Income_{i,t}}{Total\ Equity_{i,t}} \quad (11)$$ with n representing the number of segments of firm i at time t.
ROE Gap2	Levered version of ROA Gap 2.	
ROE Gap3	Levered version of ROA Gap 3.	
ROE Gap1 (Sign)	Same metric as ROE Gap 1 but taking into account the direction (+/-) of the profitability gaap.	
ROE Gap2 (Sign)	Same metric as ROE Gap 2 but taking into account the direction (+/-) of the profitability gaap.	
ROE Gap3 (Sign)	Same metric as ROE Gap 3 but taking into account the direction (+/-) of the profitability gaap.	
SplitBS	Business segment aggregation index computed as 1 minus the Herfindahl-Hirschman approach, calculated as the sum of the squared revenue shares of the company`s individual business segments. (Cho, 2015; O. K. Hope, Kang, Thomas, & Vasvari, 2008; O.-K. Hope, Kang, Thomas, & Vasvari, 2009; Lang & Stulz, 1994)	$$SplitBS_{i,t} = 1 - \sum_{j}^{n}\left(\frac{Business\ Segment\ Revenue_{i,j,t}}{Total\ Revenue_{i,t}}\right)^2 \quad (3)$$
SplitGS	Geographical segment aggregation index computed as 1 minus the Herfindahl-Hirschman approach, calculated as the sum of the squared revenue shares of the company`s individual business segments. (Cho, 2015; O. K. Hope, Kang, Thomas, & Vasvari, 2008; O.-K. Hope, Kang, Thomas, & Vasvari, 2009; Lang & Stulz, 1994)	$$SplitGS_{i,t} = 1 - \sum_{j}^{n}\left(\frac{Geopgraphical\ Segment\ Revenue_{i,j,t}}{Total\ Revenue_{i,j}}\right)^2 \quad (19)$$
GranBS_M, GranBS_D	Median per firm and year of the count of the reported mandatory line items per segment divided by the highest such observed value of all firms per year. Mandatory line items: compustat items: dps, esubs, ias, ivaeqs, nis, ops, revts; discretionary line items: all other compustat items in the business segment data set with non-missing values.	
GranGS_M, GranGS_D	Same metric as GranBS_M, GranBS_D but calculated for geographical segments.	

ACCRUALS	Ratio between depreciation and amortization as reported in the cash flow statement (Compustat Fundamental Database) scaled by the firm`s total assets (Compustat Fundamental Database). The
NESTIMATES	Natural logarithm of the number of analysts` estimates that flow into the earnings per share before extraordinary items forecast in year T
EPS_STDEV	Natural logarithm of the standard deviation of the firm`s earnings per share before extraordinary items (Compustat Fundamental Database) in the most recent 5 fiscal years, from year T-5 to T
SIZE	Natural logarithm of the total revenue as reported by the firm in year T(Compustat Fundamental Database)
MARKET CAP	Natural logarithm of the total revenue as reported by the firm in year T(Compustat Fundamental Database)
ASSETS	Total assets
REVENUE	Total revenue.
DEBT TO EQUITY	Debt-to-equity ratio.
N SEGBUS	Number of business segments reported by the firm in year T (Compustat Segment Database)
N SEGGEO	Number of geographical segments reported by the firm in year T (Compustat Segment Database)
N NAICS BUS	Number of NAICS (North American Industry Classification System) codes that the company reports in year T allocated to a firms business segments.
N NAICS GEO	Number of NAICS (North American Industry Classification System) codes that the company reports in year T allocated to a firms geographical segments.
Further control variables in the regression analysis.	- Diversification dummy variable: Total number of different business sectors in which the firm is active in year T, as obtained from the first two digits of the reported firm-wide NAICS codes (Compustat Segment Database). - Industry-fixed effects: The first two digits of the Standard Industrial Classification (SIC) Code, denoting the major industry group in which the firm is primarily active, which appear in the firms`s disseminated filings in year. - Firm-fixed effects.