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IFRS 8 and the cost of capital in Europe

Ahmed Saleh[1,2] | Ahmed Aboud[3,4] | Yasser Eliwa[5,6]

[1]Faculty of Business and Law, Coventry University, Coventry, United Kingdom

[2]Faculty of Commerce, Mansoura University, Mansoura, Egypt

[3]Faculty of Business & Law, University of Portsmouth, Portsmouth, United Kingdom

[4]Faculty of Commerce, Beni-Suef University, Beni Suef, Egypt

[5]School of Business and Economics, Loughborough University, Leicestershire, United Kingdom

[6]Faculty of Commerce, Cairo University, Giza, Egypt

Correspondence
Ahmed Saleh, Coventry University, Faculty of Business and Law, Gosford St, Coventry CV1 5DL, United Kingdom.
Email: ahmed.saleh@coventry.ac.uk

Abstract

This study examines segment reporting information usefulness after the adoption of IFRS 8 in 18 European Union countries. Specifically, 1) we introduce a new comprehensive measure of segment reporting quality that reflects four different dimensions of segment information, 2) we investigate the impact of segment reporting quality on the cost of equity and debt capital after the adoption of IFRS 8, and 3) we investigate the moderating role of the country-level enforcement system on the association between segment reporting quality and the cost of equity and debt capital after the adoption of IFRS 8. Using a self-constructed segment reporting quality measure and a sample of 884 firm-year observations over the period of 2007 to 2011, we provide evidence that investors and lending institutions find no change in the usefulness of segment reporting after the adoption of IFRS 8. Our study is original in using a comprehensive measure of segment reporting quality. Furthermore, our study is the first to examine the relationship between segment reporting quality and the cost of debt capital after the adoption of IFRS 8 and the moderating role of the country-level enforcement system. Our findings provide useful insights to regulator and accounting standard-setting bodies about segment reporting.

KEYWORDS
IFRS 8, segment reporting quality, the cost of debt capital, the cost of equity capital, the European Union, the management approach

1 | INTRODUCTION

This study investigates the impact of segment reporting quality on the cost of equity and debt capital after the adoption of IFRS 8 by 18 European Union countries. Segment reporting is essential to users of financial statements in analysing and forecasting firm performance (Botosan & Stanford, 2005; Cai et al., 2017; Ettredge et al., 2005). However, managers have been criticised for aggregating segments to external users differently from what is actually being used within the firm to reduce proprietary costs

(Botosan & Plumlee, 2005; Hayes & Lundholm, 1996) or agency costs (Berger & Hann, 2007). The previous international and US standards (IAS 14, IAS 14R, SFAS 14) requested firms to disclose segment information by both geographical areas and lines of business, whereby activities with similar returns and risks had to be reported in the same segment (Franzen & Weißenberger, 2018). This requirement allowed for managerial opportunistic behaviour to be present in the industry segmentation (line of business or geographical) by combining several operations into one segment (Leung & Verriest, 2015).

In response, standard setters started to require managers to report segments using the management approach (i.e., in accordance with their internal reporting structure). For example, in the US in 1997, SFAS 131 required externally reported segments to be defined consistently with the internal reporting structure of the business. In November 2006, the International Accounting Standards Board (IASB) issued IFRS 8 to replace IAS 14R as part of the convergence project between IASB and the US standard-setter FASB, and it became effective in January 2009 with early adoption permitted. Consequently, IFRS 8 resembled its US counterpart, SFAS 131. One of the main objectives of introducing SFAS 131, IAS 14R and afterwards IFRS 8 is to reduce the scope of managerial opportunistic behaviour in the industry segmentation under previous standards. According to SFAS 131, firms are required to report segments that are consistent with how they are reported internally to the Chief Operating Decision Maker (CODM). This 'management approach' is meant to increase the usefulness of segment reporting by allowing investors to see through the eyes of management (Kajüter & Nienhaus, 2017). The IASB simply adopted the management approach of segment reporting as it seemed to have been working satisfactorily in the US since June 1997 and to achieve convergence with US GAAP (Botosan & Plumlee, 2005; Ettredge et al., 2005; Ettredge et al., 2006; Hope et al., 2009; Hossain, 2008; Street et al., 2000).

Although the resemblance between the two standards, whether the impact of IFRS 8 in the context of European countries will be the same as the impact of SFAS 131 in the US remains an open research question. Generalizing results from US settings to European countries is inappropriate for two main reasons. First, the development of SFAS 131 in the US is different from the development of IFRS 8 in European countries (Franzen & Weißenberger, 2018; Leung & Verriest, 2015). In the US, the issuance of SFAS 131 is a complete change in segment reporting regulation compared to SFAS 14. It represents a switch from a weak standard to a completely different and more reliable standard resulting in a clearer impact on firms adopting the new standard. In contrast, in the European countries, the impact of IFRS 8 adoption on firms might be mitigated by the previous revision of IAS 14 in 1997 which required the management approach to be applied even though to some extent overridden by a risk and reward qualification. Therefore, the switch from IAS 14R to IFRS 8 represents a less radical change compared to the US segment reporting change in 1997 (Franzen & Weißenberger, 2018). Second, country-level factors are different in the US and European countries. Even within Europe, country-level factors are considerably different. For example, European

countries have different law enforcement systems and shareholder rights compared to the US (Leung & Verriest, 2015). Franzen and Weißenberger (2018) pointed out that differences in reporting cultures between the US and European countries and lack of experience in providing segment reporting in European countries would result in lower segment reporting quality. Prior studies show that differences in country-level factors have an impact on reporting quality and its consequences (e.g., El Ghoul et al., 2018; Hope, 2003; Leuz et al., 2003; Nagaraj & Zhang, 2019).

In July 2013, the IASB published its report and feedback statement 'Post-implementation Review: IFRS 8 Operating Segments'. In that document, the board concluded that IFRS 8 was functioning as expected. Nevertheless, the adequacy of IFRS 8 and its economic consequences on firms have been the subject of an ongoing debate for the last decade in academia. In the US context, prior studies document a significant improvement in the usefulness of segment information after the adoption of SFAS 131. Nevertheless, the majority of prior studies failed to provide similar evidence on positive economic consequences of IFRS 8 adoption in the international context (André et al., 2016; Franzen & Weißenberger, 2018; Kajüter & Nienhaus, 2017; Leung & Verriest, 2015). For the cost of capital, in particular, accounting disclosure and information precision reduce information asymmetries, which in turn decreases the cost of capital (Blanco et al., 2015; Easley & O'hara, 2004; Lambert et al., 2007). In particular, segment information was found to be beneficial for valuation purposes, predictive ability of future performance and monitoring activities (Behn et al., 2002; Ettredge et al., 2002; Ettredge et al., 2005; Hope et al., 2009; Kou & Hussain, 2007). For instance, Hope et al. (2009), using a sample from the US, show that disaggregation of geographical information provides relevant information for the valuation of foreign operations and that discontinuing this information damage the information environment. In addition, financial statement users have defined segment information as one of the most useful information where the majority of performance assessment models used by analysts and investors are built upon segment information (Abraham et al., 2012; PwC, 2007). Therefore, segment reporting is key to improving information precision and should be associated with a lower cost of capital (Bertomeu & Cheynel, 2016). Nevertheless, the reported evidence in the international context on the economic consequences of IFRS 8 adoption is mixed and unclear (André et al., 2016; Franzen & Weißenberger, 2018; Leung & Verriest, 2015), which is against the findings in the US context. One explanation of these mixed findings is the variations in the country of study or the measurement of segment information (Ettredge et al., 2005; Franzen &

Weißenberger, 2018; Leung & Verriest, 2015). Therefore, we investigate the impact of segment reporting quality on the cost of equity and debt capital after the adoption of IFRS 8 using a comprehensive measure of segment reporting quality that comprises four different dimensions. Moreover, taking into account differences between IFRS 8 and its US GAAP counterpart and the importance of country-level factors, we investigate the impact of the country-level enforcement system on the association between segment reporting quality and the cost of equity and debt capital after the adoption of IFRS 8 for a sample of listed firms from 18 European countries.

We contribute to the literature in the following ways. First, our paper adds to prior studies on the role of segment reporting in equity and debt markets. The association between segment reporting and the cost of equity capital has been examined in US setting (Blanco et al. (2015); Yoo and Semenenko (2012). However, this research question is not directly addressed in existing research on the European/IFRS 8 setting. While the only study by Leung and Verriest (2015) find no impact of IFRS 8 adoption on properties of analyst forecasts and the cost of equity capital, they confined their study to geographical segment reporting only and, hence, their finding should be interpreted carefully. Furthermore, while the impact of segment reporting on the cost of debt capital has been examined in the US setting (Franco et al., 2016), there is no prior study that investigates the impact of segment reporting quality on the cost of debt capital after the adoption of IFRS 8 in the European Union. We draw on the large size of the debt market and its importance in the current international financial system. According to new research by the McKinsey Global Institute,[1] global debt has continued to rise since the financial crisis of 2008. Total debt has increased by 74%, from $97 trillion in 2007 to $169 trillion in the first half of 2017; government debt accounts for 43% of this increase, and non-financial corporate debt for 41%. The debt held by non-financial corporations has grown by $29 trillion (almost as much as government debt). Also, the latest statistics[2] indicate that the global debt market size is approximately double the size of the global domestic equity market capitalisation ($87.16 trillion) in 2017. The significance of the global debt market size and its importance to corporate financing invites examination of the nature of the association between IFRS 8 adoption and the cost of debt.

Second, we investigate the moderating impact of enforcement level on the relationship between segment reporting quality and the cost of equity and debt capital after the adoption of IFRS 8. Prior literature fails to control for country-level factors when testing this relationship (Aboud et al., 2018; André et al., 2016; Franzen &

Weißenberger, 2018, Aboud & Roberts, 2018). Furthermore, Franzen and Weißenberger (2018), who examines a sample of German listed firms, call to examine IFRS 8 impact in other countries. Prior literature documents that country-level characteristics affect financial reporting practices and related outcomes (Ahmed et al., 2013; Ball et al., 2000; Byard et al., 2011; Christensen et al., 2016). Therefore, little is known about the moderating impact that country-level factors have on the usefulness of segment information after IFRS 8 adoption.

The third contribution is a methodological one, as we propose a comprehensive measure of segment reporting quality that comprises four different dimensions. We believe that prior studies that examine the economic consequences of segment reporting after the adoption of IFRS 8 (André et al., 2016; Crawford et al., 2012; Leung & Verriest, 2015; Nichols et al., 2012) lack examining number of aspects of segment reporting including the level of cross-segment consistency and variability of segment information in the annual reports after the adoption of IFRS 8. Finally, sample selection has been an issue in many prior studies on segment reporting either due to examining either a small sample size or a single country sample, or even both. In contrast, we utilise a unique, hand-collected data set comprising a large sample from 18 European countries to enhance the generalisability of our findings.

The remainder of this paper is organised as follows. In Section 2, we review the related literature and develop hypotheses. Section 3 explains the research design. Section 4 presents descriptive statistics, main results, and robustness tests. Section 5 concludes the paper.

2 | LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 | Adoption of IFRS 8 and the cost of capital

In November 2006, the IASB issued IFRS 8 'Operating Segments' to replace IAS 14R and it became effective in January 2009, with early adoption permitted. IFRS 8 followed SFAS 131 and replaced the risk and returns approach with the management approach. The management approach is meant to align segment information with the information used internally by management with the objective of reporting segment information to external users through the eyes of management, a change that was is expected to enhance the relevance of segment information (IASB, 2006). IFRS 8 makes significant changes to segments identification, measurement and

disclosure of segment information. Therefore, we argue in this study that the impact of IFRS 8 adoption on the cost of equity and debt capital is a function of how these changes impact segment reporting quality.

Information asymmetry theory predicts that the level of information disclosure has a potential to decrease the cost of capital through mitigating adverse selection and moral hazard problems (Daske et al., 2013; Lambert et al., 2007). Segment reporting, in particular, can play an essential role in reducing the cost of capital. Segment reporting provides information that is useful for understanding business activities, making judgements about the company as a whole, and understanding future growth prospects (e.g., predicting the firm's future cash flows). This, in turn, should improve a firm's information environment and, thereby, lead to a reduction in estimation risk (Blanco et al., 2015; Dutta & Nezlobin, 2017; Fosu et al., 2016; Kajüter & Nienhaus, 2017; Kent & Bu, 2020). More importantly, according to the IASB (IASB, 2006; IASB, 2013), the adoption of IFRS 8 is expected to lead to a further reduction in information asymmetry between outsiders and insiders and/or between privately informed and ordinary investors because segment information is reported through the eyes of management.

Furthermore, segment reporting is expected to reduce the information asymmetry between borrowing firms and lending institutions by providing additional information on the co-insurance effect provided by diversification and its impact on the firms' credit risk (Franco et al., 2016). According to Lewellen (1971), Higgins and Schall (1975), and Galai and Masulis (1976), a more diversified firm enjoys a co-insurance effect through the aggregation of different business segments with imperfectly correlated earnings which leads to a lower volatility of overall earnings and, therefore, the firm's risk of default, relative to a portfolio of comparable undiversified firms. Consequently, lending institutions should assess the co-insurance effect of a firm's industrial diversification before providing credit facilities to borrowing firms. We believe that segment reporting provides important information for this kind of assessment.

Prior literature focuses mainly on segment reporting in a US context. These studies investigate the economic consequences of segment information associated with the transition from SFAS 14 to SFAS 131. In general, these studies show that segment reporting after the adoption of SFAS 131 improved (Berger & Hann, 2003; Doupnik & Seese, 2001; Ettredge et al., 2006; Herrmann & Thomas, 2000; Street et al., 2000) and had positive economic consequences (Botosan & Plumlee, 2005; Collins & Henning, 2004; Ettredge et al., 2005; Ettredge et al., 2006). In particular, Blanco et al. (2015) find that after the adoption of SFAS 131, US firms with improved

segment reporting enjoyed a lower cost of equity capital. Furthermore, Yoo and Semenenko (2012) find that lower segment reporting is associated with higher cost of equity capital. Franco et al. (2016) find a similar association with the cost of debt when firms improve segment disclosures as a result of SFAS 131.

In European countries, the adoption of IFRS 8 resulted in changes in segment information. Evidence in prior studies suggests that the quantity of disclosure, as measured by the number of line items, decreased and the disaggregation of segment information increased following IFRS 8 (André et al., 2016; Cereola et al., 2017; Crawford et al., 2012; Nichols et al., 2013). However, the findings of previous studies regarding the economic consequences of these changes are still unclear and mixed (André et al., 2016; Franzen & Weißenberger, 2018; Kajüter & Nienhaus, 2017; Leung & Verriest, 2015). One explanation of these mixed findings is the variations in the research design. For instance, using a sample of a single country, Franzen and Weißenberger (2018) conclude that the mandatory IFRS 8 adoption by German firms had no impact on information asymmetry and forecast accuracy. Franzen and Weißenberger used the mandatory adoption date as an event to control for the impact of IFRS 8. However, they did not measure the level of segment reporting before and after this adoption.

Other studies examined only the disaggregation level to measure segment reporting. For example, Leung and Verriest (2015) used the number of geographical segments reported and find no impact of IFRS 8 adoption on properties of analyst forecasts and the cost of equity capital. They find no evidence on the relationship between IFRS 8 adoption and the cost of equity capital in 18 European countries. However, they confined their study to geographical segment reporting only and, hence, their finding should be interpreted carefully and should not be generalised to all aspects of segment reporting. Similarly, Kajüter and Nienhaus (2017) used the number of segments reported in firms' annual reports to find that the adoption of IFRS 8 is associated with a reduction in information asymmetry and has incremental value relevance compared to IAS 14. Also, Mardini et al. (2018) and Bugeja et al. (2015) used the number of segments reported to measure the level of segment reporting. While Mardini et al. (2018) find that segment information is value relevant after the adoption of IFRS 8, Bugeja et al. (2015) find that the switch to IFRS 8 is not associated with analyst forecast errors and dispersion. André et al. (2016) used the number of segment-line items disclosed and the cross-segment variation in profitability to measure segment reporting and find that IFRS 8 is not associated with analyst forecast errors. This variation in the measurement of segment reporting is another possible explanation of the mixed results provided by prior studies.

Based on the above discussion and the scarcity of studies on the impact of IFRS 8 adoption on the cost of capital, we posit the following hypotheses:

> **H1.** *There is a significant negative association between segment reporting quality and the cost of equity capital after the adoption of IFRS 8.*

> **H2.** *There is a significant negative association between segment reporting quality and the cost of debt capital after the adoption of IFRS 8.*

2.2 | The moderating effect of the country-level enforcement system on the relationship between IFRS 8 adoption and the cost of capital

Prior studies document that institutional settings, such as the level of enforcement and investor protection, play an important role in explaining the variations in the quality of disclosures as well as its economic consequences. For instance, Kvaal and Nobes (2012) provide evidence on the existence of national patterns of IFRS practice. Preiato et al. (2015) find that differences between countries in the auditing environment and the enforcement of accounting standards play a key role in enhancing the quality of financial reporting and capital market benefits. Also, Anagnostopoulou (2017) finds that accounting quality is value-relevant and has a substantial effect on the cost of debt capital only if legal enforcement is stronger. He argues that 'efficiency of enforcement at the country level should lead to a stronger degree of influence of accounting quality on the cost of debt capital because lenders consider this information more reliable to project the future cash flows and the probability of default for borrowers' (Anagnostopoulou, 2017, p. 182). Likewise, Cao et al. (2017) reveal that voluntary disclosure, measured by management forecasts, is associated with a lower cost of capital, and its impact on the cost of capital is stronger in countries with stronger investor protection and better information dissemination. Also, Oz and Yelkenci (2018) find that IFRS represents a constraint on accrual earnings management in code law origin countries, and it highlights a constraint on real earnings management only for common law countries when the enforcement intensity increases.

Although some studies addressed the consequences of IFRS 8 in the European context, none of these studies explored the variations among countries in the anticipated consequences of this new standard (Aboud et al., 2018; André et al., 2016; Franzen & Weißenberger, 2018). Franzen and Weißenberger (2018) call for cross-country

studies to examine the impact of IFRS 8 in contexts other than Germany, and to allow for cross-country variations in the anticipated effects. In a literature review study, Nichols et al. (2013) conclude that there is limited evidence after the introduction of IFRS 8 on the differences in segment reporting among countries. Therefore, our study extends the existing literature on the consequences of IFRS 8 by examining whether the country-level enforcement system drives the anticipated benefits associated with IFRS 8. Consistent with previous studies, we expect that the level of enforcement in a country should result in a stronger association between segment reporting after IFRS 8 adoption and the cost of capital. Based on the above discussion, we posit the following hypotheses:

> **H3.** *The association between segment reporting quality and the cost of equity capital after the adoption of IFRS 8 is more significant in countries that have a strong enforcement system.*

> **H4.** *The association between segment reporting quality and the cost of debt capital after the adoption of IFRS 8 is more significant in countries that have a strong enforcement system.*

3 | METHODOLOGY

3.1 | Variables measurement

3.1.1 | Segment reporting quality (*SR-Qlty*)

The difficulty of measuring disclosure quality has been considered as an issue by many studies (Healy & Palepu, 2001; Cooke & Wallace, 1989). In addition, (Beyer et al., 2010, p. 311) assert that 'a sensible economic definition and a direct measure of financial reporting quality are missing from the literature'. This difficulty makes the process of measuring the level of disclosure an unresolved issue until now, and segment reporting is no exception. Prior studies introduced various measures of segment reporting; however, none of these measures is comprehensive in a sense that each measure reflects only one aspect of segment reporting (Aboud et al., 2018; André et al., 2016; Berger & Hann, 2007; Cereola et al., 2017; Franzen & Weißenberger, 2018; Kajüter & Nienhaus, 2017; Nichols et al., 2012). Hence, this study introduces a new comprehensive measure of the quality of segment reporting using four dimensions (quantity, disaggregation, cross-segment variability and structure consistency) (see Appendix A). The measure was

reviewed by five academics in UK universities who have publications in the area of segment reporting. They described the list as being comprehensive and very thorough. Regarding overtime reliability, the result of recoding the firms in the pilot study indicated high stability of the checklist results.

Dimension 1: Segment information quantity (Qnty)

This study uses a self-built index to measure the quantity of segment information by examining the existence or non-existence of segment information disclosed in the financial statements notes. The index consists of 53 segment information items, of which 38 items are relevant to individual operating segments of the entity while the remaining 15 items are relevant to entity-wide disclosures (see Appendix B). These items have been extracted from IFRS 8, IAS14R and other prior studies examining the quantity of segment information after the adoption of IFRS 8. We use an unweighted index where the existence of an item is awarded 1 while 0 is awarded for non-existent items, with the exception of reconciliation items, which are awarded 2 if detailed items provided. Furthermore, a relative segment information quantity score is calculated by dividing the actual score by the maximum score applicable for a company. For instance, if there are no differences between group revenue and the sum of segment revenue, the reconciliation item will not be applicable, and the firm will not be penalised for non-disclosure.

Dimension 2: Segment information disaggregation (Disagg)

Segment information is to provide financial statements to users with additional disaggregated information about individual segments beyond the firm-wide information. This is more probable to improve financial statements users' ability to assess the nature and financial outcome of business activities and the operating economic environment. According to the IASB, financial information is relevant if it helps in the prediction of firms' future outcomes (IASB, 2010). Furthermore, prior studies find that disaggregation of segment information enhances sales and earnings predictability (Herrmann & Thomas, 1997; Hussain, 1997). We use two different proxies for disaggregation: 1) geographical disaggregation (G-Disagg), calculated as the weighted percentage of the sum of individual geographical segment sales to total sales figure of a company. 2) business disaggregation (B-Disagg), which is not only the number of segments disclosed but also the disaggregation of revenues cross segments. Following Berger and Hann (2003), the Herfindahl Revenues index is used to measure business disaggregation, and calculated as the sum of squares of individual segment sales deflated by

the squared sum of segments sales (Berger & Hann, 2003). For the Herfindahl Revenues, the lower the score, the higher the disaggregation. To provide a direct proxy, the disaggregation measure is calculated as one minus the score and, consequently, the higher the value, the higher the level of disaggregation.

Dimension 3: Cross-segment variability (Variab)

Cross-segment variability (Variab) dimension is used as a proxy for the relevance of segment information. It measures to what extent segment information is useful in making sound economic decisions by financial statements users. Consequently, segment information is deemed more relevant to users' decision making needs when business activities based on different risks or returns are distinctively reported in different segments. Wang et al. (2011) find that SFAS 131 improved the quality of segment information by requiring or allowing the revelation of greater cross-segment variability in earnings growth. Furthermore, the aggregation rule in IFRS 8 should result in high cross-segment variability in return due to clustering operating segments that are very different from other operating segments in the firm (André et al., 2016; Ettredge et al., 2006). This study uses cross-segment variability in return as a proxy for the relevance of segment information. We use the absolute standard deviation of a firm's segments return on assets (ROA) to measure cross-segment variability.

Dimension 4: Segment information consistency (Consst)

The last dimension of segment information quality is Segment information consistency (Consst). It measures structure consistency with which segment information is disclosed through the annual report (the narrative section compared to segment notes in the annual report). A firm using the same structure to report segment information in the narrative section compared to segment notes in the annual report is awarded a score of 1, while a firm that reports either more or less segments in the narrative section compared to the segments notes in the annual report is awarded 0. Although consistency is not one of the qualitative characteristics of useful accounting information identified by the IASB conceptual framework, it helps to enhance comparability (IASB, 2010).

The SR-Qlty score, then, provides a comprehensive scoring of a firm's segment reporting quality based on the reported information of the four-segment reporting dimensions. Percentile rank scoring methodology is adopted to calculate the SR-Qlty and the four dimensions scores. It is based on three factors: (1) total number of firms that are worse than the current firm. (2) total number of firms that have the same value as the current firm. (3) total number of firms that have value at all.

Percentile rank score, in general, is not very sensitive to outliers. The distribution of the scores generated with percentile rank score is nearly flat; therefore, the average and standard deviation of the scores generated with percentile rank score are not overly useful. The *SR-Qlty* score is the equally weighted sum of the four dimensions.

which are the auditing working environment quality and the level of compliance with accounting standards in each country. Brown et al. (2014) provide evidence that their index outperformed general legal proxies for country-level measures (for details see Brown et al., 2014; Preiato et al., 2015).

$$\text{Score} = \frac{\text{no.of firms with the worst value} + \dfrac{\text{no.of firms with the same value as the current firm}}{2}}{\text{no.of firms with a value}}$$

3.1.2 | The cost of equity capital (*CoE*)

Our study follows Dhaliwal et al. (2006) and El Ghoul et al. (2011) in estimating the cost of equity capital in June of each year based on the ex-ante/implied measures. To do so, we extract from the *I/B/E/S* Database the analysts' forecast data recorded in June for the sample that has positive 1 and 2 year ahead consensus earnings forecasts and positive long-term growth forecasts. Then, we estimate the cost of equity capital using the average of three models (r_{MEAN}): the price-earnings-growth ratio model (r_{PEG}) (Easton, 2004); the modified price-earnings growth ratio (Easton, 2004) (r_{MPEG}) and the modified economy-wide growth model (Gode & Mohanram, 2003) (r_{GM}). This measure seeks to reduce biases and measurement errors in the regression analysis by averaging the different cost of equity capital estimates (Echterling et al., 2015; Hail & Leuz, 2006).

3.1.3 | The cost of debt capital (*CoD*)

We measure *CoD* using the interest expense of a firm, divided by the average interest-bearing debt outstanding (Eliwa, Gregoriou, & Paterson, 2019; Francis et al., 2005; Gray et al., 2009; Lugo, 2017). Also, we use credit ratings as a robustness measure, which is based on the Fitch agency score.

3.1.4 | Country-level enforcement system

To measure the quality of the enforcement system in each country, our study uses the index measuring the quality of the auditing environment and the strength of accounting enforcement activity (Brown et al., 2014). The index proposed by Brown et al. (2014) is designed to measure the institutional differences in accounting enforcement between countries based on two main perspectives,

3.1.5 | Control variables

In our multivariate analysis that examine the relationship between segment reporting and the cost of equity capital, we follow prior studies in determining control variables shown to affect the cost of equity capital (e.g., Eliwa et al., 2016; Francis et al., 2005; Gray et al., 2009). These control variables are firm size (*Size*), market Beta (*Beta*), leverage (*Lev*) and growth (*Grth*). *Size* is measured as a natural logarithm of a company's total assets. We measure *Beta* using a five-year rolling beta calculated from the CAPM model using monthly data. *Lev* is a company's debt deflated by total assets. *Grth* is the log of one plus the company's growth in book value of equity over the previous year. According to prior studies, it is expected to find a negative relationship between the cost of equity capital and both *Beta* and *Lev* as high-risk companies financed with much debt are supposed to have a higher cost of equity capital. In contrast, it is expected to find a negative relationship between the cost of equity capital and both *Size* and *Grth* since large companies or high growth companies can raise equity funds more cheaply (Eliwa et al., 2016; Francis et al., 2005; Gray et al., 2009). As the 2008–2009 financial crisis (*Crisis*) had significant consequences on the level of economic activity, we add *Crisis* to the main model, which is measured as a dummy variable equal to 1 for years of 2008 and 2009 and zero otherwise. It is expected to find a positive association between *Crisis* and the cost of equity capital (Eliwa et al., 2016).

Moving to the relationship between segment reporting and the cost of debt capital, prior studies identified four control variables that have significant effects on the cost of debt. These control variables are *Size*, *Lev*, return on assets (*ROA*), and interest rate coverage (*IntCov*) (Eliwa, Aboud, & Saleh, 2021; Eliwa, Gregoriou, & Paterson, 2019; Francis et al., 2005; Gray et al., 2009). *ROA* is measured as the net income deflated by total assets, and *IntCov* as the total operating income deflated

by total interest expense (Eliwa, Gregoriou, & Paterson, 2019; Francis et al., 2005; Gray et al., 2009). According to prior studies, it is expected to find a negative relationship between the cost of debt capital and both *Size* and *ROA*. So, firms with higher *ROA* are in a better financial position and often acquire loans with lower borrowing costs. *IntCov* is a measure of firms' capabilities to pay their interest. So, it is probable that firms with a higher rate of interest coverage to have a lower cost of debt (Eliwa, Gregoriou, & Paterson, 2019; Francis et al., 2005; Gray et al., 2009). Also, *Crisis* is added to the main model. It is expected to find a positive association between *Crisis* and the cost of debt capital (Eliwa, Gregoriou, & Paterson, 2019).

3.2 | Sample selection

Our sample covers all top 500 non-financial[3] European Union firms based on the Financial Times list. The data consists of up to 4 years of annual financial reports of publicly-traded companies in the European Union. The final sample consists of 884 firm-year observations over the period of 2007 to 2011. We choose this period because

TABLE 1 Total number of firm-year observations per country

Country	Number of firm-year observations	Percent	Enforcement strength
Austria	18	2%	No
Belgium	17	1.9%	No
Czech Republic	8	0.9%	No
Denmark	38	4.3%	No
Finland	32	3.6%	Yes
France	157	17.8%	No
Germany	122	13.8%	Yes
Greece	8	0.9%	No
Hungary	4	0.5%	Yes
Ireland	4	0.5%	Yes
Italy	44	5%	No
Luxembourg	4	0.5%	Yes
Netherlands	52	5.9%	Yes
Poland	8	0.9%	No
Portugal	16	1.8%	No
Spain	42	4.8%	No
Sweden	76	8.6%	Yes
UK	234	26.5%	Yes
Total	884	100	

on 1 January 2009 IFRS 8 became effective, this allows us to cover 2 years before IFRS 8 adoption (2007 and 2008) and 2 years after the adoption (2009 and 2010). Furthermore, it allows to include in our sample firms that started applying the standard in 2010, hence, for those firms, we cover 2 years before IFRS 8 adoption (2008 and 2009) and 2 years after the adoption (2010 and 2011). We obtain the required data from the annual reports, *Thomson Reuters DataStream* and *IBES* databases. Table 1 reports the number of firm-year observations per country. To remove the outliers, we winsorised all variables to the 1st and 99th percentiles (Francis et al., 2005).

3.3 | Model design

Two main models have been used to test the association between segment reporting quality and both the cost of equity and debt capital after the adoption of IFRS 8. More specifically, we use model (1) to test H1 related to examining the impact of segment reporting quality on the cost of equity capital after IFRS 8 adoption by adding the interaction term *SR-Qlty*IFRS8*, while H3, related to the moderating role of the country-level enforcement system on the impact of segment reporting quality on the cost of equity capital after the adoption of IFRS 8, is examined by adding the interaction term *SR-Qlty*IFRS8*Enforce*. In addition to examining the *SR-Qlty* variable as a composite measure of segment reporting quality, the four individual dimensions of segment reporting (*Qnty*, *Disagg*, *Variab*, and *Consst*) have been examined in the analysis.

$$
\begin{aligned}
CoE_{it} = {} & \alpha + \beta_1\, Size_{it} + \beta_2\, Lev_{it} + \beta_3\, Beta_{it} + \beta_4\, Grth_{it} \\
& + \beta_5\, Crisis_{it} + \beta_6\, Enforce_{it} + \beta_7\, IFRS8_{it} + \beta_8\, SR \\
& - Qlty_{it} * IFRS8_{it} + \beta_9\, SR - Qlty_{it} * Enforce_{it} \\
& + \beta_9\, IFRS8_{it} * Enforce_{it} + \beta_{10}\, SR - Qlty_{it} \\
& * \beta_8\, IFRS8_{it} * Enforce_{it} + v_{it}
\end{aligned}
$$

$$(1)$$

where *CoE* is the cost of equity; *Size* is a natural logarithm of total assets; *Lev* is the total debt of a firm deflated by total assets; *Beta* is the 60 months rolling beta obtained from CAPM estimates; *Grth* is the log of one plus the firm's growth in book value of equity over the previous year; *Crisis* is a dummy variable equal to one for years of 2008 and 2009, and zero otherwise; *Enforce* is a dummy variable equal to one for strong enforcement systems, and zero for weak enforcement systems (Brown et al., 2014); *IFRS8* is a dummy variable equal to one for years after the adoption of IFRS 8, and zero otherwise; *SR-Qlty* is a composite measure of segment reporting quality based on four dimensions (quantity, disaggregation, cross-segment variability and structure consistency).

Model (2) has been used in the cost of debt analysis to test H2 and H4 as follows:

$$\begin{aligned} CoD_{it} &= \alpha + \beta_1\, Size_{it} + \beta_2\, Lev_{it} + \beta_3\, ROA_{it} + \beta_4\, IntCov_{it} \\ &\quad + \beta_5\, Crisis_{it} + \beta_6\, Enforce_{it} + \beta_7\, IFRS8_{it} + \beta_8\, SR \\ &\quad - Qlty_{it} * IFRS8_{it} + \beta_9\, SR - Qlty_{it} * Enforce_{it} \\ &\quad + \beta_9\, IFRS8_{it} * Enforce_{it} + \beta_{10}\, SR - Qlty_{it} \\ &\quad * \beta_8\, IFRS8_{it} * Enforce_{it} + v_{it} \end{aligned}$$

(2)

where CoD is the cost of debt; ROA is the net income before extraordinary items divided by total assets; $IntCov$ is the total operating income divided by total interest expense.

4 | MAIN TESTS AND RESULTS

4.1 | Descriptive statistics and univariate analysis

Table 2 provides descriptive statistics on the cost of debt and equity capital. For the pooled sample, the mean of the cost of equity capital is 0.12 and median is 0.11, while the mean of the cost of debt capital is 0.05 and the median is 0.06, which is consistent with prior studies (see, e.g., El Ghoul et al., 2011). Table 2, also, provides descriptive statistics on segment reporting quality and its four individual dimensions. The quantity of segment information (Qnty) has significantly decreased from 0.530 before IFRS8 adoption to 0.486 after IFRS8 adoption. This finding is consistent with prior studies for the UK and European countries (Aboud et al., 2018; Franzen & Weißenberger, 2018; Leung & Verriest, 2015; Nichols et al., 2012). With regard to segment information disaggregation, two proxies were used, namely, geographical disaggregation (G-Disagg) and business disaggregation (B-Disagg). Consistent with prior studies (André et al., 2016; Cereola et al., 2017; Crawford et al., 2012; Nichols et al., 2013), our results show that G-Disagg significantly increased after the adoption of IFRS 8, while B-Disagg shows no significant change.

The third dimension is cross-segment variability (Variab); again, this measure shows no significant change after the adoption of IFRS8 compared to before the adoption. This finding is inconsistent with US studies which find a significant positive association between the management approach prompted US companies to report segments and level of cross-segment variability (Ettredge et al., 2006; Wang et al., 2011). The fourth measure examines consistency (Consst) of segment reporting structure along the annual report. Results show an insignificant increase in the structure consistency of segment information after the adoption of IFRS8 (83% of the sample firms had structure consistency before the adoption, while after the adoption 90% had structure consistency). This is inconsistent with Nichols et al. (2012) who find a high consistency level in the annual reports for a European

TABLE 2 Descriptive statistics on the cost of equity capital, the cost of debt, segment reporting variables and firm characteristics

Variable	Pre-IFRS8					Post-IFRS8					T-test
	Mean	SD	0.250	Mdn	0.750	Mean	SD	0.250	Mdn	0.750	
CoE	0.105	0.0406	0.0843	0.0990	0.116	0.134	0.0677	0.0943	0.113	0.156	7.69***
CoD	0.0587	0.0402	0.0428	0.0533	0.0641	0.0552	0.0473	0.0363	0.0482	0.0625	−1.21
SR-Qlty	0.526	0.262	0.297	0.536	0.747	0.491	0.312	0.211	0.484	0.770	−1.83*
Qnty	0.366	0.0861	0.316	0.360	0.415	0.347	0.0943	0.290	0.340	0.405	−3.06***
G-Disagg	2.030	0.717	1.780	2.036	2.505	2.154	0.723	1.913	2.265	2.685	2.24**
B-Disagg	0.561	0.201	0.464	0.601	0.721	0.574	0.204	0.479	0.634	0.723	0.84
Variab	0.124	0.131	0.0475	0.0782	0.150	0.110	0.114	0.0443	0.0747	0.130	1.39
Consst	83% of firms had structure consistency					90% of firms had structure consistency					chi-squared 1.404
Beta	1.023	0.491	0.689	0.950	1.310	1.018	0.491	0.673	0.978	1.290	
Size	16.09	1.383	15.13	16.06	17.07	16.18	1.347	15.17	16.10	17.08	
Lev	0.263	0.151	0.150	0.259	0.365	0.267	0.148	0.161	0.248	0.373	
Grth	0.0517	0.262	−0.0671	0.0563	0.158	0.123	0.223	0.0177	0.118	0.211	
ROA	0.0654	0.0589	0.0329	0.0566	0.0912	0.0544	0.0570	0.0241	0.0479	0.0783	
IntCov	16.98	44.59	3.589	6.471	13.09	19.03	51.38	2.934	5.956	13.52	

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed.

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TABLE 3 Pearson correlations for the cost of equity capital, the cost of debt capital, segment reporting variables and firm characteristics

	CoE	CoD	SR-Qlty	Qnty	G-Disagg	B-Disagg	Disagg	Variab	Consst	Beta	Size	Lev	Grth	ROA
CoE	1													
CoD	−0.0767 *0.0280*	1												
SR-Qlty	0.0834 *0.0164*	−0.078 *0.0202*	1											
Qnty	0.0876 *0.0117*	−0.0871 *0.0095*	0.9057 *<0.0001*	1										
G-Disagg	0.0924 *0.0195*	−0.0469 *0.2207*	0.3161 *<0.0001*	0.0689 *0.0528*	1									
B-Disagg	−0.0393 *0.3271*	0.015 *0.6981*	0.3345 *<0.0001*	0.0543 *0.129*	0.0614 *0.0901*	1								
Disagg	−0.0318 *0.4175*	0.021 *0.5796*	−0.3986 *<0.0001*	−0.0944 *0.0072*	−0.7354 *<0.0001*	−0.7192 *<0.0001*	1							
Variab	0.051 *0.2308*	0.0641 *0.1188*	0.0099 *0.7946*	−0.0328 *0.3883*	0.0329 *0.3921*	0.0691 *0.0695*	−0.0677 *0.0746*	1						
Consst	−0.0046 *0.9081*	−0.0764 *0.048*	−0.0567 *0.1161*	−0.0629 *0.0812*	−0.004 *0.9128*	−0.0252 *0.4929*	0.023 *0.5247*	0.0553 *0.1562*	1					
Beta	0.3122 *<0.0001*	0.0092 *0.7859*	0.0993 *0.0032*	0.1356 *0.0001*	−0.081 *0.0347*	0.0066 *0.8641*	0.0537 *0.158*	0.0582 *0.1576*	−0.0761 *0.0491*	1				
Size	0.0901 *0.0095*	−0.2305 *<0.0001*	0.1987 *<0.0001*	0.2051 *<0.0001*	0.0641 *0.0925*	0.1202 *0.0018*	−0.1196 *0.0015*	−0.0784 *0.0553*	0.0914 *0.0176*	−0.0424 *0.2091*	1			
Lev	0.0002 *0.9945*	0.3001 *<0.0001*	0.0487 *0.146*	0.0782 *0.0195*	0.0415 *0.277*	−0.0205 *0.5949*	−0.0062 *0.8696*	−0.1256 *0.0021*	−0.0538 *0.1627*	−0.1703 *<0.0001*	0.2637 *<0.0001*	1		
Grth	0.0284 *0.4161*	0.0344 *0.308*	−0.0551 *0.1011*	−0.0724 *0.0313*	0.0132 *0.7314*	−0.0454 *0.2419*	0.0143 *0.7059*	0.0136 *0.7414*	−0.0405 *0.2961*	0.0126 *0.7093*	−0.0784 *0.0196*	−0.1191 *0.0004*	1	
ROA	−0.1982 *<0.0001*	0.0344 *0.3071*	−0.0888 *0.0079*	−0.108 *0.0012*	−0.0101 *0.7906*	−0.0315 *0.4141*	0.0072 *0.8483*	0.1759 *<0.0001*	−0.0221 *0.5658*	−0.1267 *0.0002*	−0.2975 *<0.0001*	−0.278 *<0.0001*	0.244 *<0.0001*	1
IntCov	−0.0645 *0.0645*	0.041 *0.2241*	−0.0359 *0.286*	−0.0478 *0.155*	0.0593 *0.1215*	−0.0606 *0.1176*	−0.0099 *0.7937*	0.0999 *0.0149*	0.1079 *0.0052*	−0.0076 *0.8227*	−0.219 *<0.0001*	−0.3645 *<0.0001*	0.0342 *0.3115*	0.4863 *<0.0001*

Note: [a,b] The sample consists of 884 firm-year observations over the period 2007 to 2011 (8 industries). *Size* = the natural logarithm of total assets in year *t*; *Leverage* = the ratio of total debt to total assets in year *t*; *ROA* = return on assets of a firm in year *t*, *IntCov* = the ratio of operating income to interest expense of a firm in year *t*; *Growth* is the log of one plus the company's growth in book value of equity over the previous year.

sample, excluding the UK.[4] However, our finding is in agreement with Crawford et al. (2012) who find that there is still some inconsistency in the annual reports between the narrative sections of the annual reports and the segmental note after the adoption of IFRS 8. In brief, the individual dimensions of segment reporting quality after the adoption of IFRS 8 either declined significantly (*Qnty*), increased significantly (*G-Disagg*) or stayed at the same level of before the adoption of IFRS, (*B-Disagg*), (*Variab*), and (*Consst*). Regarding control variables, for the pooled sample (not tabulated), the mean of *Lev* is 0.27 and the median is 0.25. The mean of *Size* is 16, and the median is 16. Mean of *Grth* is 0.09 and median is 0.9. The mean of market *Beta* is 1.02, and the median is 0.96. The mean of *IntCov* is 18, and the median is 6.15.

Table 3 reports the correlations between the cost of equity and debt capital, segment reporting variables and control variables. In contrast to our expectations, our results show mixed correlations between segment reporting quality and the cost of equity capital. While results indicate significant positive correlations for *SR-Qlty*, *Qnty*, and *G-Disagg*; insignificant correlations have been found for *B-Disagg*, *Variab*, and *Consst*. For the cost of debt capital, again, results are mixed. While *SR-Qlty* and *Qnty* have significant negative correlations; insignificant correlations have been found for *G-Disagg*, *B-Disagg*, *Variab* and *Consst*. Thus, based on our univariate analysis, H1 and H3 are not supported. Table 3 also examines the associations between the individual dimensions and the total score of segment reporting quality. The low correlations across proxies (highest coefficient is 0.3345) indicate that the four dimensions complement each other to gain a full picture of segment reporting practices. Furthermore, the correlation coefficient between geographical and business disaggregation is low (0.0614), indicating that geographical and business information disaggregation are complements to each other, and a proper disaggregation measure should consider both.

Moving to control variables, Table 3 shows that there is a significant positive correlation between the cost of equity capital and *Beta*. Also, it shows a significant negative correlation between the cost of equity capital and both *Size* and *ROA*. Moreover, it shows a significant negative correlation between the cost of debt and both *Size* and *ROA*. Finally, it shows a positive correlation between the cost of debt and *Lev*.

4.2 | Multivariate results

In our multivariate tests, we examine the impact of segment reporting quality on both the cost of equity and debt capital after the adoption of IFRS 8. Regression results are presented in Tables 4 and 5. The adjusted *R*-squares are 10% and 21.5%, suggesting that these models explain a reasonable amount of the variation in the cost of equity and debt capital, respectively. These adjusted *R*-squares are also consistent with prior studies of the cost of capital for European firms (see, for example, El Ghoul et al., 2011).

4.2.1 | The relationship between IFRS 8 adoption and the cost of equity capital

Table 4 reports the results of the association between segment reporting and the cost of equity capital (H1) and the moderating role of the country-level enforcement system on this association (H3). Regarding H1, column 1 includes our main variables *SR-Qlty*, *IFRS8*, *Enforce*, and *SR-Qlty*IFRS8*. Similar to the univariate results, *SR-Qlty*IFRS8* is insignificant, indicating that there is no change in the association between segment reporting quality and the cost of equity capital before the adoption of IFRS 8 compared to after the adoption of IFRS 8. This finding is in agreement with prior studies that fail to provide evidence on any change in the information usefulness of segment reporting as a result of applying IFRS 8 (André et al., 2016; Bugeja et al., 2015; Franzen & Weißenberger, 2018; Leung & Verriest, 2015). Furthermore, consistent with prior studies (Anagnostopoulou, 2017; Cao et al., 2017), we find that the country-level enforcement system has a significant negative association with the cost of equity capital.

Moving to H3, testing the moderating role of the country-level enforcement system in the association between IFRS 8 adoption and the cost of equity capital, column 2 (Table 4) extends column 1 by adding the interaction term *SR-Qlty*IFRS8*Enforce*. In contrast to our expectations, the insignificant coefficient of the two-level interaction term *SR-Qlty*IFRS8*Enforc* indicates that the country-level enforcement system has no moderating role in the association between segment reporting quality and the cost of equity capital after the adoption of IFRS 8. This finding is inconsistent with prior studies suggesting that country-level institutional factors, such as the level of enforcement and investor protection, play an important role in explaining the variations in the quality of disclosures as well as its market consequences (Kvaal & Nobes, 2012; Preiato et al., 2015).

Columns 3, 5, 7, and 9 in Table 4 examine the association between the four individual dimensions of segment reporting quality and the cost of equity capital after IFRS 8 adoption. Consistent with our bivariate analysis, results show that IFRS 8 adoption has no impact on the associations between the cost of equity capital and the individual dimensions *Qnty*, *Disagg*, *Variab*, and *Consst* of

TABLE 4 The relationship between segment reporting variables and the cost of equity capital

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Beta	0.041***	0.041***	0.040***	0.040***	0.040***	0.040***	0.049***	0.050***	0.039***	0.039***
	(7.61)	(7.55)	(7.56)	(7.48)	(6.18)	(6.17)	(7.34)	(7.45)	(5.99)	(5.99)
Size	0.0036**	0.0036**	0.0035**	0.0038**	0.0034**	0.0034**	0.0058***	0.0063***	0.0035**	0.0035**
	(2.45)	(2.46)	(2.43)	(2.51)	(1.99)	(1.99)	(3.51)	(3.68)	(2.05)	(2.04)
Lev	0.015	0.015	0.014	0.015	0.010	0.0089	0.019	0.017	0.0070	0.0071
	(1.02)	(1.05)	(0.96)	(1.09)	(0.62)	(0.54)	(1.21)	(1.03)	(0.40)	(0.40)
Grth	−0.031***	−0.030***	−0.030***	−0.029***	−0.027***	−0.028***	−0.032***	−0.031***	−0.027**	−0.027**
	(−3.47)	(−3.41)	(−3.44)	(−3.33)	(−2.65)	(−2.66)	(−2.92)	(−2.86)	(−2.52)	(−2.51)
Crisis	0.021***	0.021***	0.021***	0.021***	0.020***	0.020***	0.021***	0.021***	0.021***	0.022***
	(5.39)	(5.32)	(5.48)	(5.41)	(4.88)	(4.85)	(4.80)	(4.93)	(5.00)	(4.97)
IFRS8	0.0100	0.012	0.0044	0.018	−0.00025	−0.014	0.0067	−0.030	0.027*	0.041
	(1.25)	(0.40)	(0.53)	(0.54)	(−0.026)	(−0.35)	(0.72)	(−0.89)	(1.66)	(0.75)
TotalEnforce	−0.00062**	−0.00073	−0.00061**	−0.00091	−0.00084***	−0.0021*	−0.00067**	−0.00044	−0.00090***	−0.00092
	(−2.43)	(−0.81)	(−2.36)	(−1.07)	(−2.90)	(−2.10)	(−2.38)	(−0.45)	(−2.82)	(−0.67)
SR-Qlty	0.0058	0.0023								
	(0.55)	(0.061)								
IFRS8*SR-Qlty	−0.0041	−0.013								
	(−0.31)	(−0.28)								
Qnty			0.0026	−0.010						
			(0.25)	(−0.29)						
IFRS8*Qnty			0.0070	−0.025						
			(0.50)	(−0.51)						
Disagg					−0.014	−0.081*				
					(−1.13)	(−1.69)				
IFRS8*Disagg					0.014	0.038				
					(0.88)	(0.57)				
Variab							0.0069	0.023		
							(0.54)	(0.53)		
IFRS8*Variab							0.0018	0.068		
							(0.10)	(1.03)		

TABLE 4 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Consst									0.043*	0.046
									(1.75)	(0.60)
IFRS8*Consst									−0.039	−0.072
									(−1.21)	(−0.75)
TotalEnforce*SR-Qlty		0.00014								
		(0.095)								
IFRS8*TotalEnforce		−0.000089		−0.00051		0.00054		0.0015		−0.00052
		(−0.077)		(−0.42)		(0.39)		(1.18)		(−0.29)
IFRS8*TotalEnforce*SR-Qlty		0.00035								
		(0.20)								
Enforce*Qnty				0.00050						
				(0.35)						
IFRS8*TotalEnforce*Qnty				0.0013						
				(0.65)						
Enforce*Disagg						0.0026				
						(1.54)				
IFRS8*TotalEnforce*Disagg						−0.00093				
						(−0.41)				
Enforce*Variab								−0.00060		
								(−0.36)		
IFRS8*TotalEnforce*Variab								−0.0027		
								(−1.11)		
Enforce*Consst										−0.000093
										(−0.037)
IFRS8*TotalEnforce*Consst										0.0013
										(0.40)
Constant	0.024	0.026	0.026	0.030	0.046	0.079*	−0.020	−0.035	0.018	0.019
	(0.88)	(0.74)	(0.97)	(0.89)	(1.36)	(1.82)	(−0.62)	(−0.78)	(0.52)	(0.36)
N	842	842	842	842	662	662	565	565	638	638
Adj. R^2	0.169	0.166	0.170	0.169	0.155	0.158	0.212	0.215	0.162	0.158

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed. t-statistics in parentheses.

TABLE 5 The relationship between segment reporting variables and the cost of debt capital

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lev	−0.088***	−0.088***	−0.088***	−0.088***	−0.066***	−0.064***	−0.060***	−0.056***	−0.063***	−0.064***
	(−6.84)	(−6.86)	(−6.84)	(−6.89)	(−5.24)	(−5.19)	(−4.54)	(−4.41)	(−4.93)	(−4.96)
Size	−0.0061***	−0.0060***	−0.0061***	−0.0061***	−0.0065***	−0.0065***	−0.0070***	−0.0074***	−0.0061***	−0.0061***
	(−3.66)	(−3.69)	(−3.72)	(−3.78)	(−3.39)	(−3.43)	(−3.00)	(−3.15)	(−3.12)	(−3.14)
ROA	−0.059	−0.060	−0.060	−0.059	−0.097**	−0.10**	−0.11*	−0.11*	−0.10**	−0.10**
	(−1.32)	(−1.33)	(−1.34)	(−1.31)	(−1.97)	(−2.05)	(−1.73)	(−1.75)	(−2.11)	(−2.09)
IntCov	−0.000071	−0.000071	−0.000071	−0.000071	−0.000030	−0.000023	−0.0000049	0.0000039	−0.000016	−0.000018
	(−0.99)	(−0.98)	(−1.00)	(−0.99)	(−0.39)	(−0.30)	(−0.047)	(0.037)	(−0.18)	(−0.19)
Crisis	−0.0051*	−0.0051*	−0.0053*	−0.0052*	−0.0028	−0.0030	−0.0044	−0.0046	−0.0029	−0.0030
	(−1.79)	(−1.79)	(−1.87)	(−1.82)	(−0.89)	(−0.99)	(−1.27)	(−1.32)	(−0.94)	(−0.99)
IFRS 8	−0.0033	0.0016	0.00081	0.0047	0.0036	−0.031**	−0.0073	−0.0075	−0.00089	−0.0044
	(−0.50)	(0.074)	(0.13)	(0.22)	(0.65)	(−2.14)	(−1.33)	(−0.45)	(−0.12)	(−0.18)
TotalEnforce	−0.00040**	−0.00038	−0.00041**	−0.00019	−0.00015	−0.00038	−0.00011	−0.00097***	−0.000075	−0.00061
	(−2.42)	(−0.66)	(−2.45)	(−0.38)	(−0.83)	(−1.19)	(−0.56)	(−2.78)	(−0.44)	(−1.25)
SR-Qlty	−0.0069	−0.0063								
	(−0.91)	(−0.26)								
IFRS8*SR-Qlty	0.00058	−0.0085								
	(0.058)	(−0.27)								
Qnty			−0.0029	0.0074						
			(−0.47)	(0.37)						
IFRS8*Qnty			−0.0075	−0.014						
			(−0.80)	(−0.46)						
Disagg					0.0037	−0.012				
					(0.68)	(−0.78)				
IFRS8*Disagg					−0.0077	0.076**				
					(−0.72)	(2.56)				
Variab							0.00096	−0.044**		
							(0.16)	(−2.48)		
IFRS8*Variab							0.014	0.013		
							(1.09)	(0.34)		

TABLE 5 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Consst									−0.018**	−0.049**
									(−2.49)	(−2.24)
IFRS8*Consst									0.00074	0.015
									(0.060)	(0.39)
TotalEnforce*SR-Qlty		−0.000028								
		(−0.033)								
IFRS8*TotalEnforce		−0.00019		−0.00016		0.0013**		−0.000041		0.00013
		(−0.26)		(−0.22)		(2.01)		(−0.061)		(0.14)
IFRS8*TotalEnforce*SR-Qlty		0.00036								
		(0.33)								
TotalEnforce*Qnty				−0.00041						
				(−0.57)						
IFRS8*TotalEnforce*Qnty				0.00028						
				(0.26)						
TotalEnforce*Disagg						0.00062				
						(0.98)				
IFRS8*TotalEnforce*Disagg						−0.0032**				
						(−2.58)				
TotalEnforce*Variab								0.0017**		
								(2.44)		
IFRS8*TotalEnforce*Variab								0.00019		
								(0.12)		
TotalEnforce*Consst										0.0012
										(1.44)
IFRS8*TotalEnforce*Consst										−0.00053
										(−0.36)
Constant	0.20***	0.20***	0.20***	0.19***	0.19***	0.19***	0.19***	0.22***	0.19***	0.20***
	(6.33)	(5.71)	(6.34)	(5.70)	(5.29)	(5.50)	(4.71)	(5.08)	(5.14)	(5.46)
N	882	882	882	882	694	694	591	591	667	667
Adj. R^2	0.131	0.128	0.131	0.128	0.105	0.111	0.100	0.104	0.101	0.098

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed. t-statistics in parentheses.

segment reporting quality. Furthermore, columns 4, 6, 8, 10 in Table 4 examine the moderating role of the country-level enforcement system on these associations. Results show that the country-level enforcement system has no moderating role in the impact of IFRS 8 adoption on the associations between the cost of equity capital and the individual dimensions *Qnty*, *Disagg*, *Variab* and *Consst* of segment reporting quality after IFRS 8 adoption. However, *Variab* is the only dimension that has a significant negative coefficient. This means that the relationship between segment information cross variability and the cost of equity capital is significant in countries that have a strong enforcement system. In brief, H1 is rejected for all segment reporting variables, while H3 rejected for all segment reporting variables except for segment information cross variability (*Variab*) dimension only.

Moving to control variables, Table 4 reports significant negative relationships between the cost of equity capital and both *Size* and *Grth*, which is consistent with prior studies (e.g., Francis et al., 2005; Gray et al., 2009). Firms with large size have a lower cost of equity capital, and high growth has a relatively lower cost of equity capital compared to low growth firms. Also, the results show a positive association between the cost of equity capital and both *Lev* and *Beta*, which is consistent with prior studies (e.g., Francis et al., 2005; Gray et al., 2009). Finally, the results show a significant positive association between *Crisis* and the cost of equity capital.

4.2.2 | The relationship between IFRS 8 adoption and the cost of debt capital

As discussed in Section 2, we expect a significant association between segment reporting quality and the cost of debt capital after IFRS 8 adoption (H2). Furthermore, we expect this relationship to be more significant in countries that have a strong enforcement system (H4). Regarding H2, the interaction term *SR-Qlty*IFRS8* in column 1 (Table 5) is insignificant indicating that there is no change in the association between the segment reporting quality and the cost of debt capital before the adoption of IFRS 8 compared to after the adoption of IFRS 8. This finding is consistent with our cost of equity capital analysis and other studies that examined different economic consequences (André et al., 2016; Bugeja et al., 2015; Franzen & Weißenberger, 2018; Leung & Verriest, 2015). However, there are no prior studies that examined the impact of IFRS 8 on the cost of debt capital to compare our results with. Furthermore, consistent with prior studies (Anagnostopoulou, 2017; Cao et al., 2017), we find that the country-level enforcement system has a significant negative association with the cost of equity capital.

Moving to H4 testing the moderating role of the country-level enforcement systems in the association between IFRS 8 adoption and the cost of debt capital. In contrast to our expectations but consistent with our findings in the cost of equity capital analysis, the insignificant coefficient of the interaction term *SR-Qlty*IFRS8*Enforce* indicates that the country-level enforcement system has no moderating role in the association between segment reporting quality and the cost of debt capital (see Table 5, column 2). Again this finding is inconsistent with prior studies (Kvaal & Nobes, 2012; Preiato et al., 2015). Columns 3, 5, 7, and 9 in Table 5 show that there is no significant change in the association between all individual dimensions of segment reporting quality and the cost of debt after the adoption of IFRS 8 compared to before. Furthermore, columns 4, 6, 8, 10 in Table 5 show that the country-level enforcement system has no moderating role in the impact of IFRS 8 adoption on the association between all individual dimensions of segment reporting quality and the cost of debt capital. In brief, H2 and H3 are rejected for all segment reporting variables.

Moving to control variables, Table 5 reports significant negative relationships between the cost of debt capital and *Size* and *ROA*. Also, we find a negative relationship between the cost of debt capital and *Lev* which is consistent with previous studies (e.g., Francis et al., 2005; Gray et al., 2009). Firms with high *ROA* have a lower cost of debt capital, and large firms have a lower cost of debt capital compared to smaller firms. Also, firms with high leverage have a higher cost of debt capital. Lastly, Table 5 reports a positive association between the cost of debt capital and *IntCov* (e.g., Francis et al., 2005; Gray et al., 2009).

Overall, we find no evidence that the adoption of IFRS 8 had a significant impact on the usefulness of segment reporting quality and its individual dimensions. Thus, we cannot conclude that IASB's expectations on the market benefits of IFRS 8 have been materialised for European listed firms at least based on our findings. In fact, the European Parliament expressed serious concerns about IFRS 8's adoption and requested an in-depth assessment. Although the introduction of the adoption of the management approach in the USA context has improved the quality of segment information and enhance the information environment, the usefulness of IFRS 8 in Europe still unclear. This, in turn, suggests that using identical standards to the US standard may not achieve the same benefits.

4.3 | Robustness tests

We report in this section robustness tests that have been conducted to investigate whether the main evidence on

TABLE 6 The relationship between segment reporting and credit ratings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lev	−11.7	−12.0	−14.0*	−9.69	−13.1	−11.8	−10.7	−13.4	−9.59	−15.6*
	(−1.54)	(−1.57)	(−1.67)	(−1.10)	(−1.56)	(−1.49)	(−1.34)	(−1.59)	(−1.09)	(−1.85)
Size	10.5***	10.5***	9.80***	8.95***	9.44***	10.6***	10.6***	9.82***	8.98***	9.41***
	(12.7)	(12.6)	(10.7)	(9.02)	(10.1)	(12.8)	(12.8)	(10.2)	(8.44)	(9.26)
ROA	167.0***	164.8***	160.6***	154.4***	167.6***	163.9***	164.8***	164.1***	155.6***	169.9***
	(6.59)	(6.56)	(6.11)	(5.41)	(6.69)	(6.67)	(6.59)	(6.18)	(5.36)	(6.76)
IntCov	0.022	0.023	−0.026	−0.048	−0.034	0.014	0.014	−0.021	−0.050	−0.031
	(0.47)	(0.48)	(−0.45)	(−0.88)	(−0.62)	(0.31)	(0.30)	(−0.36)	(−0.92)	(−0.56)
Crisis	5.03**	4.95**	6.15***	6.23***	6.59***	4.94**	4.93**	5.66**	5.79**	6.09***
	(2.51)	(2.47)	(2.82)	(2.68)	(3.04)	(2.49)	(2.48)	(2.58)	(2.44)	(2.73)
IFRS 8	6.03	7.95	1.98	3.82	8.27	13.6**	13.3**	4.79	−1.88	−3.73
	(1.20)	(1.62)	(0.46)	(0.79)	(1.34)	(2.04)	(2.15)	(0.76)	(−0.32)	(−0.42)
Total Enforce	0.073	0.070	0.19	0.11	0.20	0.076	0.070	0.21	0.12	0.17
	(0.57)	(0.54)	(1.44)	(0.80)	(1.52)	(0.60)	(0.55)	(1.56)	(0.83)	(1.22)
SR-Qlty	2.19					5.36				
	(0.36)					(0.56)				
IFRS8*SR-Qlty	−7.58					−6.89				
	(−1.00)					(−0.54)				
Qnty		5.30					9.65			
		(0.97)					(1.24)			
IFRS8*Qnty		−10.9					−17.8			
		(−1.46)					(−1.50)			
Disagg			2.68					10.2		
			(0.46)					(0.95)		
IFRS8*Disagg			2.91					−7.13		
			(0.35)					(−0.47)		
Variab				13.9***					4.94	
				(2.62)					(0.59)	
IFRS8*Variab				−4.63					−1.15	
				(−0.58)					(−0.088)	

(Continues)

TABLE 6 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Consst					25.5***					15.4*
					(3.81)					(1.85)
IFRS8*Consst					−9.31					−13.8
					(−0.87)					(−1.05)
Total Enforce*SR-Qlty						−10.7				
						(−0.86)				
IFRS8*Total Enforce						11.7	13.3*	8.84	−6.57	−6.30
						(1.43)	(1.74)	(1.36)	(−1.00)	(−0.80)
IFRS8*Total Enforce*SR-Qlty						−6.11	−0.44	4.30	6.11	16.8*
						(−1.01)	(−0.069)	(0.72)	(0.75)	(1.83)
Enforce*Qnty							−13.7			
							(−1.23)			
IFRS8*Total Enforce*Qnty							17.6			
							(1.15)			
Enforce*Disagg								−13.4		
								(−1.05)		
IFRS8*Total Enforce*Disagg								17.6		
								(0.97)		
Enforce*Variab									16.2	
									(1.42)	
IFRS8*Total Enforce*Variab									−6.88	
									(−0.40)	
Enforce*Consst										16.4
										(1.31)
IFRS8*Total Enforce*Consst										12.0
										(0.59)
Constant	−135.4***	−136.6***	−125.2***	−114.1***	−132.1***	−142.5***	−145.1***	−130.9***	−111.6***	−125.6***
	(−9.29)	(−9.39)	(−7.58)	(−6.67)	(−8.31)	(−9.18)	(−9.60)	(−7.46)	(−5.99)	(−7.10)
N	366	366	264	214	263	366	366	264	214	263
Adj. R^2	0.331	0.332	0.338	0.365	0.369	0.335	0.335	0.335	0.362	0.370

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed. t-statistics in parentheses.

the associations between segment reporting quality and the cost of equity and debt capital after the adoption of IFRS 8 are robust to alternative model specifications and assumptions. First, we use credit ratings[5] instead of the interest rate as a measure of the cost of debt capital (Devalle et al., 2017; Ge & Liu, 2015; Klusak et al., 2019; Oikonomou et al., 2014). We still find no significant association between segment reporting quality and credit rating before and after the adoption of IFRS 8 (results reported in Table 6). Second, we examine the impact of the segment reporting quality on the individual measures of the cost of equity capital after the adoption of IFRS 8, namely the price-earnings-growth ratio model (r_{PEG}) (Easton, 2004); the modified price-earnings growth ratio (Easton, 2004) (r_{MPEG}) and the modified economy-wide growth model (Gode & Mohanram, 2003) (r_{GM}). In all models (not tabulated), the coefficient of interest, the coefficient on the interaction terms *SR-Qlty*IFRS8* and *SR-Qlty*IFRS8*Enforce*, stay insignificant. Third, we use Christensen et al.'s (2013) measure of the quality of accounting regulation enforcement instead of Brown et al.'s (2014) measure. We still find that the country-level enforcement system plays no moderating role in the association between segment reporting quality and the cost of equity and debt capital (results reported in Tables 7 and 8). Fourth, our sample shows a high representation of UK firms (approximately 25%), which is a common characteristic of sample distributions in most of the European studies (e.g., Aharony et al., 2010; Byard et al., 2011; Daske et al., 2008; Glaum et al., 2013). To tackle the problem of sample selection bias and check the robustness of our results, we exclude the UK firms from the sample and re-regress all models find similar results (results reported in Tables 9 and 10). Finally, similar to disclosure studies, a concern in relation to the analysis is the potential endogeneity, which might hinder the interpretation of the causal relationship between segment reporting and the cost of capital (Gippel et al., 2015). In particular, we conduct the instrumental variables estimation method to the primary models. The industry average scores of segment reporting quality are used. Also, we use a dummy variable for whether the previous year's earnings is negative (loss) as an instrumental variable for segment reporting quality. The results indicate that endogeneity concerns are not likely affecting our main evidence (results reported in Table 11).

5 | DISCUSSION AND CONCLUSION

Our study uses a unique hand-collected data set to measure the quality of segment reporting 2 years before and 2 years after the adoption of IFRS 8. We investigate a sample of non-financial European Union firms based on the Financial Times list. First, we propose a new comprehensive measure of segment reporting quality that reflects four different dimensions of segment information, namely, information quantity (*Qnty*), information disaggregation (*Disagg*), cross variability of segment return (*Variab*), and structure consistency (*Consst*). The low correlations between the total score of segment reporting quality and its individual dimensions indicate that the individual dimensions are complements, rather than substitutes, to each other. This finding suggests that in order to get a full picture of the quality of segment reporting, the four individual dimensions should be included in the measurement tool.

Second, we investigate whether segment reporting quality had an impact on the cost of capital after the adoption of IFRS 8. Our findings show no significant association between segment reporting quality and the cost of equity capital after the adoption of IFRS 8, with the exception of cross variability of segment return (*Variab*) that shows a significant negative coefficient. Our results for the cost of debt capital analysis are similar to the cost of equity capital analysis with all segment reporting variables having insignificant coefficients. Our findings are consistent with many prior studies that fail to provide evidence on the improvement of segment information usefulness after IFRS 8 adoption as suggested by the IASB (André et al., 2016; Bugeja et al., 2015; Franzen & Weißenberger, 2018; Leung & Verriest, 2015). One possible explanation of the insignificant associations between IFRS 8 adoption and the cost of capital in our study is the development of segment reporting regulations in IFRS-applying countries compared to the US settings. We interpret these findings to be in line with the notion that the impact of IFRS 8 adoption on segment reporting quality might be mitigated by the previous revision of IAS 14 which made segment reporting requirements in a middle-range position between the management approach and the risk and reward approach (Franzen & Weißenberger, 2018). IAS 14R indicated that 'The basis for identification of the predominant source and nature of risks and differing rates of return facing the entity will usually be the entity's internal organisational and management structure and its system of internal financial reporting to senior management' (IASC, 2007). Therefore, the insignificant impact of IFRS 8 on the cost of equity capital could be explained by the fact that many European firms already disclosed their segment information using the management approach under IAS 14R, as in the case under IFRS 8.

TABLE 7 The relationship between segment reporting variables and the cost of equity capital after changing the enforcement variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Beta	0.040***	0.040***	0.040***	0.039***	0.040***	0.040***	0.049***	0.051***	0.039***	0.040***
	(7.38)	(7.36)	(7.33)	(7.24)	(6.25)	(6.27)	(7.25)	(7.52)	(6.01)	(6.08)
Size	0.0032**	0.0033**	0.0032**	0.0033**	0.0027	0.0028	0.0053***	0.0052***	0.0031*	0.0024
	(2.22)	(2.26)	(2.22)	(2.27)	(1.57)	(1.59)	(3.05)	(3.06)	(1.80)	(1.40)
Lev	0.014	0.014	0.013	0.010	0.012	0.013	0.021	0.020	0.0090	0.0063
	(0.97)	(0.97)	(0.90)	(0.74)	(0.72)	(0.76)	(1.33)	(1.25)	(0.52)	(0.36)
Grth	−0.032***	−0.032***	−0.032***	−0.031***	−0.028***	−0.028***	−0.032***	−0.032***	−0.028***	−0.028**
	(−3.63)	(−3.58)	(−3.60)	(−3.54)	(−2.71)	(−2.64)	(−2.93)	(−2.89)	(−2.59)	(−2.50)
Crisis	0.020***	0.020***	0.020***	0.021***	0.020***	0.020***	0.021***	0.021***	0.021***	0.021***
	(5.23)	(5.24)	(5.34)	(5.41)	(4.78)	(4.71)	(4.74)	(4.73)	(4.88)	(4.87)
IFRS8	0.0094	0.013	0.0033	0.0077	0.00043	0.0021	0.0065	−0.014	0.027	0.030
	(1.17)	(1.11)	(0.40)	(0.68)	(0.043)	(0.14)	(0.71)	(−1.05)	(1.64)	(1.62)
Enforce	−0.0062	−0.0088	−0.0063	−0.0026	−0.0047	0.011	−0.0030	0.020	−0.0050	−0.054**
	(−1.55)	(−0.96)	(−1.55)	(−0.26)	(−1.04)	(0.81)	(−0.62)	(1.61)	(−1.04)	(−2.15)
SR-Qlty	0.0070	0.0099								
	(0.66)	(0.64)								
IFRS8*SR-Qlty	−0.0026	−0.0068								
	(−0.19)	(−0.35)								
Qnty			0.0029	0.014						
			(0.28)	(0.98)						
IFRS8*Qnty			0.0096	0.0043						
			(0.70)	(0.21)						
Disagg					−0.017	0.00091				
					(−1.34)	(0.050)				
IFRS8*Disagg					0.013	0.014				
					(0.81)	(0.57)				
Variab							0.0057	−0.017		
							(0.45)	(−1.10)		
IFRS8*Variab							0.0031	0.053**		
							(0.18)	(2.00)		

TABLE 7 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Consst									0.042*	0.0031
									(1.66)	(0.12)
IFRS8*Consst									−0.039	−0.039
									(−1.18)	(−1.28)
Enforce*SR-Qlty		−0.0069								
		(−0.34)								
IFRS8*Enforce		0.0075		0.011		0.0050		−0.043**		0.0097
		(0.49)		(0.69)		(0.25)		(−2.23)		(0.28)
IFRS8*Enforce*SR-Qlty		0.0100								
		(0.39)								
Enforce*Qnty				−0.024						
				(−1.24)						
IFRS8*Enforce*Qnty				0.014						
				(0.51)						
Enforce*Disagg						−0.037				
						(−1.43)				
IFRS8*Enforce*Disagg						0.0018				
						(0.055)				
Enforce*Variab								0.044*		
								(1.79)		
IFRS8*Enforce*Variab								−0.095***		
								(−2.69)		
Enforce*Consst										0.082
										(1.62)
IFRS8*Enforce*Consst										0.011
										(0.15)
Constant	0.017	0.014	0.020	0.013	0.038	0.026	−0.028	−0.018	0.0034	0.033
	(0.66)	(0.53)	(0.78)	(0.49)	(1.13)	(0.72)	(−0.85)	(−0.57)	(0.10)	(0.92)
N	842	842	842	842	662	662	565	565	638	638
Adj. R^2	0.165	0.162	0.166	0.165	0.145	0.148	0.206	0.214	0.150	0.161

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed. t-statistics in parentheses.

TABLE 8 The relationship between segment reporting variables and the cost of debt capital after changing the enforcement variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lev	0.086***	0.088***	0.086***	0.087***	0.065***	0.065***	0.059***	0.059***	0.063***	0.063***
	(6.70)	(6.64)	(6.70)	(6.59)	(5.10)	(5.10)	(4.41)	(4.44)	(4.84)	(4.83)
Size	−0.0061***	−0.0061***	−0.0062***	−0.0061***	−0.0065***	−0.0066***	−0.0069***	−0.0069***	−0.0061***	−0.0062***
	(−3.61)	(−3.65)	(−3.66)	(−3.68)	(−3.28)	(−3.26)	(−2.81)	(−2.80)	(−3.04)	(−3.03)
ROA	−0.061	−0.063	−0.062	−0.063	−0.10**	−0.10**	−0.11*	−0.11*	−0.10**	−0.10**
	(−1.35)	(−1.42)	(−1.36)	(−1.38)	(−2.03)	(−2.10)	(−1.78)	(−1.78)	(−2.12)	(−2.12)
IntCov	−0.000069	−0.000067	−0.000069	−0.000068	−0.000027	−0.000025	−0.0000022	−0.0000014	−0.000016	−0.000012
	(−0.95)	(−0.92)	(−0.95)	(−0.93)	(−0.34)	(−0.32)	(−0.020)	(−0.013)	(−0.17)	(−0.13)
Crisis	−0.0053*	−0.0052*	−0.0055*	−0.0054*	−0.0028	−0.0030	−0.0045	−0.0047	−0.0030	−0.0030
	(−1.85)	(−1.85)	(−1.93)	(−1.93)	(−0.91)	(−1.01)	(−1.29)	(−1.35)	(−0.96)	(−0.99)
IFRS 8	−0.0042	0.0026	−0.00030	0.0061	0.0038	0.0053	−0.0074	−0.0060	−0.00100	0.00073
	(−0.64)	(0.39)	(−0.049)	(0.84)	(0.68)	(0.87)	(−1.35)	(−0.93)	(−0.13)	(0.069)
Enforce	0.00086	0.0050	0.00084	−0.00045	0.0016	−0.0087	0.0012	−0.0034	0.00049	−0.0079
	(0.28)	(0.68)	(0.29)	(−0.057)	(0.49)	(−0.95)	(0.31)	(−0.37)	(0.15)	(−0.62)
SR-Qlty	−0.0081	0.0061								
	(−1.00)	(0.85)								
IFRS8*SR-Qlty	0.0023	−0.0034								
	(0.23)	(−0.29)								
Qnty			−0.0044	0.0041						
			(−0.68)	(0.60)						
IFRS8*Qnty			−0.0054	−0.011						
			(−0.58)	(−0.95)						
Disagg					0.0035	−0.0042				
					(0.64)	(−0.70)				
IFRS8*Disagg					−0.0080	−0.011				
					(−0.76)	(−0.99)				
Variab							0.00035	−0.0031		
							(0.059)	(−0.51)		
IFRS8*Variab							0.015	0.016		
							(1.12)	(1.04)		
Consst									−0.018**	−0.023**

TABLE 8 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
									(−2.52)	(−2.09)
IFRS8*Consst									0.00092	−0.0012
									(0.076)	(−0.070)
Enforce*SR-Qlty		−0.032*								
		(−1.77)								
IFRS8*Enforce		0.016		0.015		0.0026		0.0037		0.0044
		(1.19)		(1.23)		(0.26)		(0.32)		(0.30)
IFRS8*Enforce*SR-Qlty		0.017								
		(0.80)								
Enforce*Qnty				−0.020						
				(−1.34)						
IFRS8*Enforce*Qnty				0.016						
				(0.90)						
Enforce*Disagg						0.016				
						(1.37)				
IFRS8*Enforce*Disagg						0.0048				
						(0.26)				
Enforce*Variab								0.0054		
								(0.50)		
IFRS8*Enforce*Variab								−0.000028		
								(−0.0010)		
Enforce*Consst										0.0090
										(0.63)
IFRS8*Enforce*Consst										0.0066
										(0.29)
Constant	0.19***	0.18***	0.19***	0.18***	0.18***	0.19***	0.19***	0.19***	0.19***	0.19***
	(6.16)	(6.19)	(6.16)	(6.23)	(5.01)	(5.00)	(4.36)	(4.33)	(5.02)	(5.00)
N	884	884	882	882	694	694	591	591	667	667
Adj. R^2	0.126	0.130	0.126	0.126	0.104	0.105	0.100	0.096	0.101	0.098

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed. t-statistics in parentheses.

TABLE 9 The relationship between segment reporting variables and the cost of equity capital after excluding the UK

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Beta	0.036***	0.035***	0.032***	0.043***	0.032***	0.035***	0.034***	0.032***	0.043***	0.032***
	(5.45)	(5.36)	(3.94)	(5.35)	(3.88)	(5.35)	(5.20)	(3.96)	(5.39)	(3.83)
Size	0.0024	0.0021	0.0013	0.0037*	0.0014	0.0024	0.0024	0.0012	0.0046**	0.0014
	(1.32)	(1.18)	(0.58)	(1.71)	(0.62)	(1.33)	(1.26)	(0.56)	(1.99)	(0.65)
Lev	0.012	0.0097	0.011	0.024	0.0070	0.012	0.011	0.0075	0.021	0.0070
	(0.70)	(0.58)	(0.59)	(1.27)	(0.34)	(0.74)	(0.66)	(0.39)	(1.06)	(0.34)
Grth	−0.050***	−0.050***	−0.046***	−0.053***	−0.047***	−0.049***	−0.048***	−0.048***	−0.052***	−0.047***
	(−4.27)	(−4.28)	(−3.25)	(−3.51)	(−3.23)	(−4.14)	(−4.14)	(−3.33)	(−3.47)	(−3.14)
Crisis	0.021***	0.021***	0.022***	0.023***	0.023***	0.021***	0.021***	0.021***	0.023***	0.023***
	(4.49)	(4.60)	(4.23)	(4.30)	(4.28)	(4.46)	(4.54)	(4.21)	(4.32)	(4.28)
IFRS8	0.011	0.0055	0.0031	−0.00096	0.033	0.014	0.016	−0.019	−0.012	0.053
	(1.25)	(0.63)	(0.26)	(−0.086)	(1.53)	(0.44)	(0.49)	(−0.46)	(−0.33)	(0.92)
Total Enforce	−0.00020	−0.00017	−0.00057	−0.00034	−0.00056	−0.00043	−0.00080	−0.0026**	0.00058	−0.00085
	(−0.64)	(−0.55)	(−1.65)	(−1.00)	(−1.45)	(−0.41)	(−0.86)	(−2.48)	(0.49)	(−0.54)
SR-Qlty	0.0096					0.00035				
	(0.82)					(0.0084)				
IFRS8*SR-Qlty	−0.0040					−0.014				
	(−0.27)					(−0.28)				
Qnty		0.0086					−0.018			
		(0.80)					(−0.47)			
IFRS8*Qnty		0.0071					−0.023			
		(0.48)					(−0.43)			
Disagg			−0.0076					−0.11**		
			(−0.52)					(−2.20)		
IFRS8*Disagg			0.011					0.057		
			(0.56)					(0.84)		
Variab				−0.0065					0.044	
				(−0.47)					(0.92)	
IFRS8*Variab				0.021					0.040	
				(1.06)					(0.56)	

TABLE 9 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Consst					0.058* (1.77)					0.047 (0.59)
IFRS8*Consst					−0.046 (−1.06)					−0.087 (−0.89)
Total Enforce*SR-Qlty						0.00040 (0.23)				
IFRS8*Total Enforce						−0.00012 (−0.096)	−0.00041 (−0.32)	0.00089 (0.59)	0.00056 (0.37)	−0.00087 (−0.41)
IFRS8*Total Enforce*SR-Qlty						0.00042 (0.20)				
Total Enforce*Qnty							0.0011 (0.69)			
IFRS8*Total Enforce*Qnty							0.0012 (0.56)			
Total Enforce*Disagg								0.0042** (2.24)		
IFRS8*Total Enforce*Disagg								−0.0019 (−0.73)		
Total Enforce*Variab									−0.0020 (−1.07)	
IFRS8*Total Enforce*Variab									−0.0010 (−0.35)	
Total Enforce*Consst										0.00048 (0.17)
IFRS8*Total Enforce*Consst										0.0018 (0.51)
Constant	0.040 (1.27)	0.046 (1.45)	0.081** (1.97)	0.019 (0.48)	0.047 (1.09)	0.045 (1.17)	0.057 (1.56)	0.13*** (2.70)	−0.018 (−0.34)	0.052 (0.91)
N	621	621	481	417	458	621	621	481	417	458
Adj. R^2	0.151	0.154	0.117	0.178	0.131	0.148	0.154	0.129	0.181	0.126

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed. t-statistics in parentheses.

TABLE 10 The relationship between segment reporting variables and the cost of debt capital after excluding the UK

	(1)	(6)	(2)	(7)	(3)	(8)	(4)	(9)	(5)	(10)
Lev	0.087***	0.088***	0.086***	0.086***	0.057***	0.057***	0.046***	0.046***	0.055***	0.054***
	(6.32)	(6.19)	(6.32)	(6.13)	(4.72)	(4.73)	(3.78)	(3.73)	(4.46)	(4.41)
Size	−0.0050**	−0.0050**	−0.0049**	−0.0049**	−0.0057**	−0.0059**	−0.0061*	−0.0063*	−0.0052*	−0.0052*
	(−2.16)	(−2.19)	(−2.16)	(−2.17)	(−2.08)	(−2.09)	(−1.78)	(−1.82)	(−1.88)	(−1.83)
ROA	0.032	0.023	0.031	0.027	−0.018	−0.026	−0.0067	−0.014	−0.024	−0.025
	(0.60)	(0.44)	(0.57)	(0.51)	(−0.37)	(−0.53)	(−0.12)	(−0.25)	(−0.50)	(−0.51)
IntCov	−0.00014***	−0.00014***	−0.00014***	−0.00014***	−0.000099***	−0.000094***	−0.000096**	−0.000094**	−0.000088**	−0.000088**
	(−4.12)	(−4.16)	(−4.13)	(−4.18)	(−2.92)	(−2.84)	(−2.02)	(−2.01)	(−2.24)	(−2.24)
Crisis	−0.0028	−0.0026	−0.0030	−0.0028	−0.00047	−0.00067	−0.0017	−0.0018	−0.00063	−0.00065
	(−0.92)	(−0.87)	(−1.00)	(−0.94)	(−0.16)	(−0.23)	(−0.54)	(−0.58)	(−0.21)	(−0.22)
IFRS 8	−0.0043	0.0035	−0.00031	0.0068	0.0010	0.0049	−0.0054	−0.0059	−0.0027	0.000054
	(−0.62)	(0.53)	(−0.047)	(0.93)	(0.22)	(0.84)	(−1.10)	(−0.92)	(−0.36)	(0.0054)
Total Enforce	−0.00059	−0.0037	−0.00046	−0.0088	−0.0035	−0.016**	−0.0035	0.0073	−0.0059*	−0.0033
	(−0.18)	(−0.51)	(−0.14)	(−1.01)	(−1.02)	(−2.07)	(−0.86)	(1.02)	(−1.86)	(−0.23)
SR-Qlty	−0.0047	0.0059								
	(−0.53)	(0.79)								
IFRS8*SR-Qlty	0.0040	−0.0039								
	(0.36)	(−0.33)								
Qnty			−0.0023	0.0035						
			(−0.32)	(0.51)						
IFRS8*Qnty			−0.0042	−0.011						
			(−0.41)	(−0.95)						
Disagg					−0.0037	−0.0054				
					(−0.78)	(−0.91)				
IFRS8*Disagg					−0.0015	−0.0076				
					(−0.18)	(−0.71)				
Variab							−0.011**	−0.0061		
							(−2.20)	(−1.09)		
IFRS8*Variab							0.012	0.019		
							(1.23)	(1.26)		

TABLE 10 (Continued)

	(1)	(6)	(2)	(7)	(3)	(8)	(4)	(9)	(5)	(10)
Consst									−0.023***	−0.019**
									(−2.93)	(−2.10)
IFRS8*Consst									0.0049	0.0021
									(0.37)	(0.13)
Total Enforce*SR-Qlty		−0.035								
		(−1.34)								
IFRS8*Total Enforce		0.027		0.024		0.011		0.0014		0.0050
		(1.43)		(1.47)		(1.27)		(0.14)		(0.32)
IFRS8*Total Enforce*SR-Qlty		0.030								
		(1.07)								
Total Enforce*Qnty				−0.019						
				(−0.98)						
IFRS8*Toal Enforce*Qnty				0.025						
				(1.12)						
Total Enforce*Disagg						0.0055				
						(0.51)				
IFRS8*Total Enforce*Disagg						0.017				
						(1.02)				
Total Enforce*Variab								−0.017		
								(−1.61)		
IFRS8*Total Enforce*Variab								−0.013		
								(−0.66)		
Total Enforce*Consst										−0.011
										(−0.65)
IFRS8*Total Enforce*Consst										0.0018
										(0.068)
Constant	0.17***	0.16***	0.16***	0.16***	0.17***	0.17***	0.17***	0.17***	0.17***	0.17***
	(4.03)	(4.03)	(4.01)	(4.03)	(3.34)	(3.32)	(2.85)	(2.86)	(3.35)	(3.23)
N	649	649	649	649	505	505	436	436	479	479
Adj. R^2	0.141	0.147	0.142	0.144	0.110	0.110	0.091	0.097	0.111	0.106

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed.

TABLE 11 The endogeneity test for the relationship between segment quality and the cost of equity and debt capital

	CoE	CoD
SR-Qlty	−0.078	−0.025
	(−0.76)	(−0.35)
Beta	0.041***	
	(9.87)	
Size	−0.0044**	−0.0057***
	(−2.20)	(−3.63)
Lev	0.019	0.086***
	(1.22)	(7.52)
Grth	−0.033***	
	(−3.86)	
ROA		−0.064**
		(−2.18)
IntCov		−0.000062
		(−1.60)
Crisis	0.020***	−0.0051*
	(5.09)	(−1.78)
IFRS8	−0.029	−0.013
	(−0.59)	(−0.36)
Enforce	−0.0093	0.0049
	(−0.91)	(0.66)
IFRS8*SR-Qlty	0.079	0.028
	(0.78)	(0.39)
Enforce*SR-Qlty	0.079	−0.0015
	(0.78)	(−0.022)
IFRS8*Enforce	−0.033	0.0019
	(−0.67)	(0.054)
IFRS8*Enforce*SR-Qlty	−0.074	−0.014
	(−0.74)	(−0.19)
Constant	0.037	0.19***
	(1.01)	(7.80)
N	842	881
Adj. R^2	0.126	0.121

***Denotes significance at $p < 0.01$, two-tailed; **Denotes significance at $p < 0.05$, two-tailed; *Denotes significance at $p < 0.1$, two-tailed. t-statistics in parentheses.

Another possible explanation of the insignificant impact of IFRS 8 adoption on the cost of capital is the fact that preparing segment information based on the internal management reporting structure means that segment information is not necessarily comparable. IFRS 8 has been widely criticised because of lack of standardisation of the information to be disclosed and extensive reporting of non-IFRS measures (Nichols et al., 2012; Nichols

et al., 2013). Reducing comparability of segment information between firms would reduce its usefulness to users. This concern about comparability impairment has been already raised by the European Parliament (EP, Session document, B6-0157/2007) and UK parliament (UK Parliament, Early day motion 1369) before the adoption of IFRS 8. It is worth mentioning here that, in July 2017, the IASB issued its exposure draft 'Improvements to IFRS 8 operating segments' in an attempt to overcome the problematic application of the current standard. The proposed amendments by IASB includes, but not limited to, providing additional guidance on identifying the CODM. The amendments require an entity to disclose how, and why, the reportable segments identified in the financial statements differ from those reported in other parts of the annual reporting package. Also, it adds examples of when operating segments are considered to have similar economic characteristics when applying the aggregation criteria.

Third, we investigate whether differences in the country-level enforcement system between European countries play a moderating role in the association between segment reporting quality and the cost of capital after IFRS 8 adoption. Our findings indicate that the impact of IFRS 8 adoption on the cost of capital is not affected by the differences in the level of IFRS enforcement in European countries. This finding, in fact, is in contrast to prior studies suggesting that country-level institutional factors play a significant role in explaining the variations in the quality of disclosures as well as its market consequences (Kvaal & Nobes, 2012; Preiato et al., 2015).

Our findings are in line, especially with a recent study by (Franzen & Weißenberger, 2018). However, our study is different in the following ways: First, we use a comprehensive measure that allows to clearly identify the change in segment reporting quality after the adoption of IFRS 8. Second, we do not restrict our analysis to the year of adoption only; instead, our sample covers a period of 2 years before IFRS 8 adoption and 2 years after, which allows for a better generalisability of results. Third, we extend their analysis by examining the economic consequences of IFRS 8 adoption in different European countries, which allows for controlling for differences in country-level institutional factors in the analysis.

Although our study sheds light on the firm economic consequences of the adoption of IFRS 8, it has a number of limitations that represent avenues for future research. First, our study could be extended by examining how the market competition would impact the relationship between segment reporting and the cost of capital. Segment information could benefit competitors, increasing uncertainties and increasing risk about future performance (Harris, 1998; Hayes & Lundholm, 1996).

Therefore, segment reporting could result in increasing proprietary costs when firms are facing stronger competition. According to Blanco et al. (2015), higher proprietary costs make segment reporting less effective and might even lead to an increase in the cost of capital. Bugeja et al. (2015) provide evidence based on a sample of Australian firms that the greatest reduction in segment reporting after IFRS 8 adoption occurs for firms with a higher proportion of profitable segments. Many other studies support the proprietary cost argument where increased competition leads to increased uncertainties about future performance and hence an increase in the cost of capital (Gaspar & Massa, 2006; Valta, 2012). Second, our study limited the sample firms to all non-financial top 500 European firms based on the Financial Times list. Although the large variations found in the sample with regard to *Size*, these firms are characterised by large size in market capitalisation. Large firms are committed to a richer information environment, hence, affecting the generalisability of the results to smaller firms. Therefore, a future study needs to examine more diversified sample firms in terms of market capitalisation.

Even in the light of these limitations, our results represent a thorough and timely analysis given the exposure draft 'Improvements to IFRS 8 operating segments' issued by the IASB in July 2017 in an attempt to overcome the problematic application of the current standard. Therefore, our findings should be of particular interest to the IASB.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID
Ahmed Saleh https://orcid.org/0000-0001-7961-1557
Ahmed Aboud https://orcid.org/0000-0001-8972-7203
Yasser Eliwa https://orcid.org/0000-0002-7883-6313

ENDNOTES
[1] For more details on the McKinsey Global Institute research visit: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/visualizing-global-debt.

[2] For more details, visit: https://www.statista.com/statistics/274490/global-value-of-share-holdings-since-2000/.

[3] Financial institutions have been excluded from the sample as they are subject to different disclosure requirements. Furthermore, high leverage is normal for financial institutions and, hence, does not have the same meaning as for non-financial firms.

[4] These differences explained by the samples composition. For example, the findings show that the level of consistency is 95% for German firms (not tabulated).

[5] Credit rating variable has been collected from the Thomson Reuters Asset4 database which is based on Fitch Rating: (AAA (24 points); AA+ (23 points); AA (22 points); AA− (21 points); A+ (20 points); A (19 points); A− (18 points); BBB+ (17 points); BBB (16 points); BBB− (15 points); BB+ (14 points); BB (13 points); BB− (12 points); B+ (11 points); B (10 points); B− (9 points); CCC+ (8 points); CCC (7 points); CCC− (6 points); CC+ (5 points); CC (4 points); CC− (3 points); C (2 points); D (1 points); DD (1 points); DDD (1 points)). Then all values are divided by 24 to rank all values between 0 and 1.

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APPENDIX A: SUMMARY OF SEGMENT INFORMATION QUALITY MEASUREMENT

Dimensions	Measures	Definition	Name
1) Quantity	Full segment quantity	The total number of items reported in the segmental notes measured by disclosure index	Qnty
2) Disaggregation			Disagg
2a) Geographical disaggregation	Geographical disaggregation score	$\sum_{N=1}^{N} \frac{Gi's\ sales}{TGS} * GWi$ Where N is the number of geographical areas/segments, Gi's: revenue for geographical area/segment i, GWi: geographical weight, TGS: total segments/areas revenues. For geographical weights (GW), a scale of 3 for country-specific information, scale of (2) is applied to continent or sub-continent segments such as 'The Americas' or 'North America,' a scale of (1) for multi-continent segments such as 'Europe and Asia' and zero for unspecified segments such as 'other.'	G-Disagg
2b) Business disaggregation	Herfindahl Revenues	The sum of individual segment revenues square divided by the sum of segments revenue square: $\dfrac{\sum_{i=1}^{n} S_i^2}{\left(\sum_{i=1}^{n} S_i\right)^2}$ where n = number of segments, and S_i = segment i's sales	B-Disagg
3) Cross-segment variability	SD return	The standard deviation of all segments ROA	Variab
4) Consistency	Structure consistency	A dichotomous variable takes (0) if firm 'i' provided segment information with the same structure along the annual report, and (1) otherwise.	Consst
Segment reporting quality	Composite index		SR-Qlty

APPENDIX B: SEGMENT INFORMATION QUALITY MEASUREMENT INDEX

Category one: Operating segments	Source
Description of factors used to identify segments	IFRS 8, Para.21
Description of type of products and services offered by each segment	IFRS 8, Para.21
Revenue from external customers	IFRS 8, Para.23
Intersegment revenue	IFRS 8, Para.23
Basis of intersegment revenue pricing	IFRS 8, Para.27a
Interest revenue	IFRS 8, Para.21
Interest expense	IFRS 8, Para.21
Net interest income or expense	Pilot study
Depreciation and amortization	IFRS 8, Para.23
Operating costs	Pilot study
Non cash material items (e.g., impairment)	IFRS 8, Para.23
Income tax expense	IFRS 8, Para.23

(Continues)

Category one: Operating segments	Source
Share of profit of associates and joint ventures	IFRS 8, Para.24a
Segments result (1)	IFRS 8, Para.23
Segments result (2) (some companies present more than profit measure such as OI, Ebit, NI)	Pilot study
Minority interest or non-controlling interest	IFRS 8, Para.24b
Exceptional items	Pilot study
Discontinued operations	Pilot study
Cash per segment	Street et al., 2002
Detailed cash information (Investing − operating − financing cash flows)	Street et al., 2002
Current assets	IFRS 8, Para.23
Noncurrent assets	IFRS 8, Para.23
Intangible assets	IFRS 8, Para.23
Investment in associate or/and joint ventures	IFRS 8, Para.23
Total assets	IFRS 8, Para.23
Capital expenditure	IFRS 8, Para.2
Current liabilities	IFRS 8, Para.21a
Long term liabilities	IFRS 8, Para.21a
Borrowings	Pilot study
Total liabilities	IFRS 8, Para.21a
Reconciliation of liabilities	IFRS 8, Para.27d
Reconciliation of profit	IFRS 8, Para.27b
Reconciliation of revenue	IFRS 8, Para.27b
Reconciliation of assets	IFRS 8, Para.27c
Number of employees by segment	Gray et al., 1995
Performance ratios (profitability ratios)	Gray et al., 1995
Production volume information	Gray et al., 1995
Research and development expenses	
Category two: Entity Segment disclosures	
Revenue by destination	Crawford et al., 2012
Revenue by origin	Crawford et al., 2012
Earnings	IAS 14
Current assets	IAS 14
Noncurrent assets	IAS 14
Total assets	Pilot study
Current liabilities	Pilot study
Long term liabilities	Pilot study
Borrowing by segments	Pilot study
Amortisation and depreciation	IAS 14
Total liabilities	IAS 14
Capital expenditure	IAS 14
Sales per product	IFRS 8
Major customers or statement that none exist	IFRS 8
Matrix format	IFRS 8