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THE ACCOUNTING IMPASSE OF INTANGIBLES?

Capitalised intangibles' effect on the dispersion of analysts' forecasted operating earnings

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Abstract

Purpose – The purpose of this study is to contribute to the accounting for intangibles under IFRS through examining the value relevance of capitalised intangible assets.

Design/methodology/approach – This is an empirical study of intangible assets, using data from listed firms in Europe between 2005-2018. The study uses a regression to test the relation between capitalised intangible assets and the dispersion of analysts' forecasted operating earnings.

Findings – The findings show that capitalised intangible assets have a significant negative correlation with forecasted operating earnings dispersion. The results also indicate that firms should capitalise more intangible assets.

Research limitations/implications – The limitations of this study are as follows: the chosen variables and time frame may greatly affect the outcome; and the fact that this study is unable to see whether or not some firms have reported enough intangible assets to create maximum value relevance for investors limits the generalisability.

Originality/value – This study contributes to the research on IFRS, which may aid IASB in their improvement work. The results also help firms to better understand what effects the capitalisation of intangible assets may have on the market.

Keywords Intangible assets, Analysts' earnings forecast dispersion, Value relevance

Sammanfattning

Syfte – Syftet med denna studie är att bidra till redovisningsområdet immateriella tillgångar redovisade enligt IFRS. Detta görs genom att testa kapitaliserade immateriella tillgångars värderelevans.

Design/metod/tillvägagångssätt – Detta är en empirisk studie av immateriella tillgångar som använder data från noterade europeiska företag mellan 2005-2018. Sambandet mellan kapitaliserade immateriella tillgångar och spridning i analytikers estimerade rörelseresultat testas genom en regression.

Resultat – Resultatet visar att kapitaliserade immateriella tillgångar har ett negativt signifikant samband med spridning i analytikers estimerade rörelseresultat. Resultatet pekar även på att företag borde kapitalisera fler immateriella tillgångar.

Begränsningar – Följande begränsningarna finns i denna studie: valet av variabler och tidsspann kan ha en stor påverkan på utfallet; och det faktum att studien inte fångar huruvida vissa företag redovisar tillräckligt med immateriella tillgångar för att skapa maximal värderelevans för

investerare begränsar möjligheterna att dra generaliserbara slutsatser.

Bidrag – Denna studie bidrar genom att öka mängden forskning inom området IFRS, vilket kan hjälpa IASB med deras förbättringsarbete. Resultaten hjälper även företag att bättre förstå vad kapitaliseringen av immateriella tillgångar kan ha för marknadseffekter.

Nyckelord Immateriella tillgångar, Spridning analytikerestimat, Värderelevans

摘要

研究目的 – 本文主旨在研究IFRS下资本化的无形资产的价值相关性，为无形资产会计学做出贡献。

研究设计 – 文章采用实证分析法，使用并且分析2005–2018年欧洲上市公司的数据以研究无形资产。为了检验资本化无形资产与分析师息税前利润预测偏差之间的关联，本文使用回归分析。

研究结果 – 研究结果显示，资本化无形资产与分析师息税前利润预测偏差呈显著负相关。结果也表明，企业应使更多的无形资产资本化。

研究局限 – 研究限制如下：挑选的变量以及时间段有可能对结果产生较大影响；并且这项研究无法得知被研究的企业是否已经报告了足以对投资者产生最大价值相关性的无形资产，从而限制了本文的可归纳性。

研究贡献 – 该文章为IFRS的研究做出贡献，并且有利于IASB的改善工作。同时研究结果也有助于企业更好地了解资本化无形资产对市场的影响。

关键词 无形资产， 分析师盈利预测偏差， 价值相关性

Table of contents

1 Introduction

> The future competition in the world is about intellectual property.[1]
>
> Wenbao Jia, premier of China, 2004. (Sina, 2005; Dai, 2009)

The interest in intangibles was already widespread at the turn of the millennium (Goldfinger, 1997; Bonfour, 2003). Up until today, this has only become more noticeable. The Organisation for Economic Co-operation and Development (OECD) commented back in 2006 on the shift towards a knowledge-based economy, stating that intellectual assets are becoming "crucial for firms' and countries' economic performance and growth" (OECD, 2006, p. 5). Rehnberg (2012) argues that investments in IT, human resources, R&D and marketing have been crucial to companies' success. Further, intangible assets have been referred to as the major drivers in the new knowledge-driven (Lev & Daum, 2004; Gu & Lev, 2011; Zeghal & Maaloul, 2011; Rehnberg, 2012) and technology-driven (Rehnberg, 2012) economy. They have also been regarded as the main source of value creation (Arvidsson, 2003; Bonfour, 2003; Daum, 2004; Lev, 2018b), corporate competitiveness (Bonfour, 2003; Daum, 2004) as well as growth (Chen, Cheng & Hwang, 2005; Jarboe & Furrow, 2008; Lev, Radhakrishnan & Zhang, 2009; PRV, 2016) and sustainability (Jarboe & Furrow, 2008) in not only individual firms, but also economies as a whole.

Bounfour (2003) lists a number of reasons why the interest in intangible assets has increased among both researchers and practitioners. One is a dematerialisation of production activities, where the focus has shifted from manufacturing to development, distribution, marketing and management (Goldfinger, 1997). Another reason mentioned is the disequilibrium between market and book value of listed firms (Bonfour, 2003). This applies in particular to high-tech firms such as Microsoft, with, at the time, a market to book value ratio of approximately 12. A third reason is the rapid growth in the service industry, where services contribute to over 75 % of an advanced economy's GDP. The World Bank's database shows that services, value added, made up 65 % of the GWP[2] in 2016 (World Bank, n.d.). Figure 1 demonstrates the transformation of the United States' economy during the past half century. During 1977-2016, the private industries' investment in intangible assets (relative to GVA[3]) increased by 87,5 %, whereas the aggregate investment in tangible assets declined continuously, from 16 % to roughly 10 % of value added. By the end of the 20th century, the investments in intangible assets finally surpassed those in tangible assets. The intangible economy raises a whole series of measurement issues (Goldfinger, 1997). This is especially true when it comes to accounting. Professor Lev (2018a, p.2), author of more than 200 research papers published in leading academic journals, encapsulates these problems with the following statement:

> Consider the accounting absurdity: the major value creators of modern businesses, like R&D, brands, or IT, are treated as salaries or interest expenses having no future benefits, whereas the

[1] Own translation. Original text: "世界未来的竞争就是知识产权的竞争。"
[2] Gross world product.
[3] Gross value added.

'commoditized' tangible (fixed) assets—marginal value creators because they are available to all competitors— are capitalized.

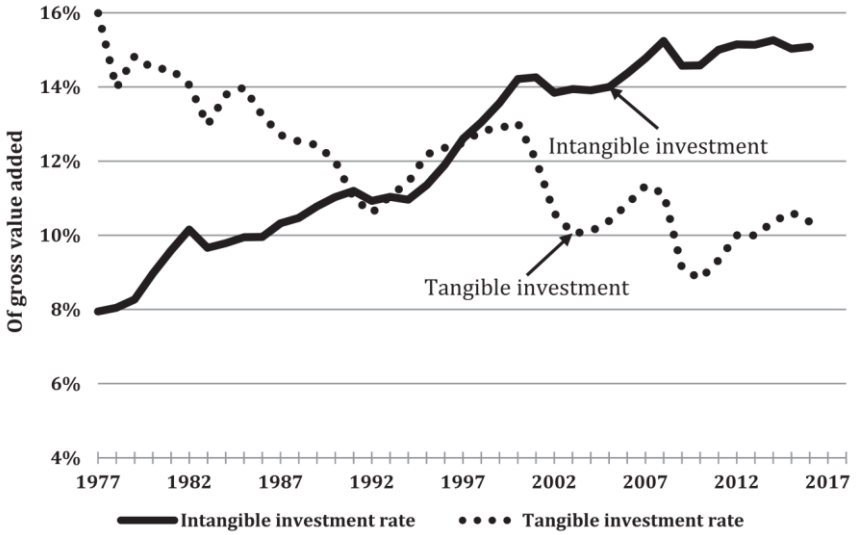

Figure 1. *Investment rates in intangible and tangible assets, private industries, 1977 to 2016* (Corrado & Hulten, 2010; Lev, 2018a).

Traditional accounting models are no longer capable of thoroughly evaluating firms in the new intangible economy, as a result of them stemming from tangible assets, the convention of conservatism as well as historical costs (Upton, 2001; Liang & Yao, 2005; Zeghal & Maaloul, 2011). Standard setters hence find themselves facing an unprecedented challenge, constructing financial statements capable of explaining the high-tech industry's market value (Liang & Yao, 2005). Lev (2018b) addresses this accounting impasse in his article, providing two reasons explaining the financial information relevance deterioration. The first originates in the latter part of the 20th century, when standard setters shifted to a *balance sheet model*, replacing the preceding *income statement approach*. Fair valuation of assets and liabilities superseded a close matching between revenues and real expenses. The second reason Lev gives, following this principle shift, is the improper application of the asset valuation model to intangible assets in the intangible economy. The outcome: "A largely uninformative balance sheet [...] and an income statement which fails to live up to its major purpose: reflecting enterprise performance and the quality of management" (Lev, 2018b, p. 465). Dichev, receiver of some of the highest research awards in accounting (AAAHQ, 2018a; AAAHQ, 2018b), supports Lev's view, stating:

> If one looks to find the economic roots of 'where does income come from?', the answer 'from change in equity' is not helpful. A better answer is that income comes from 'earning more cash than what was invested,' and that is the essence of the income statement approach. [...] The logic of accounting should follow the logic of the business it reflects. (Dichev, 2017, p. 622)

Despite the stated problems following the *balance sheet model*, the International Accounting Standards Board (IASB) has decided that this approach leads to the best possible accounting. We are left with accounting conservatism, where just about all internally generated

intangible investments are immediately expensed (Lev, Sarath & Sougiannis, 2005), a system suitable for a tangible economy (Upton, 2001; Liang & Yao, 2005; Zeghal & Maaloul, 2011). What follows is a gap between firms' market and book value, which has drawn wide research attention (e.g. Lev & Zarowin, 1999; Lev, 2001). This gap has come to be known by researchers as *intellectual capital* (IC) (e.g. Marzo, 2013; Massaro, Dumay & Bagnoli, 2017), and may be said being the result of deficient accounting practices. Plenty of research has been done to test the IC's effect on the market value of a firm (e.g. Chen, Cheng & Hwang, 2005; Wang, 2008; Clarke, Seng & Whiting, 2011). The research concludes that intellectual capital is associated with a higher valuation among investors and yields greater profitability as well as revenue growth. A similar conclusion is drawn by Ghosh and Wu (2007), who show not only that investors heed to the IC information, but also that IC plays an important role in long-term investments. The accounting, which does not reflect a firm's intellectual capital, partly as a result of insufficient capitalisation, is still important for making investment decisions, but is shown to be interpreted together with the firm's IC. Thus, like Roslender and Fincham (2004), they recognise that IC is becoming a lead indicator of long-term performance and value creation, indicating that the information in the financial reports are increasingly lacking value.

Lev (2018b, p. 466) states that there is a "widespread and increasing dissatisfaction with financial information", and that after half a century, efforts made by standard setters have not showed up in the empirical research. The dissatisfaction is in line with IC becoming a main gauge for performance and value creation (Roslender & Fincham, 2004), as well as the recent popularity of systems where measures outside the balance sheet are added, such as "balance scorecards" (Lev, 2003). Teixeira (2014), at that time staff member at the IASB, and now Deloitte's global director of IFRS[4] research (IAS Plus, 2015), argues that the IASB has recently been moving towards more evidence-based standard-setting. Thus, one of the decisions made by the IASB is to include a wide range of sources, including academic research, into a newly introduced research phase (Teixeira, 2014). The IASB is trying to encourage researchers to do more work on relevant issues. In his concluding remarks, Teixeira (2014, p. 10) states that "if real progress is to be made, the academic community also needs to take some steps." Teixeira is not alone in this view (e.g. Basu, 2013; Gao, 2013; Madsen, 2013).

1.1 Problem formulation

What has been argued for is as follows. The economy has changed from a tangible one, to an intangible (e.g. Sina, 2005; Dai, 2009). Following this unprecedented global shift, intangible assets have become the main drivers of value-creation (e.g. Lev, 2018b), growth (e.g. OECD, 2006) and competitiveness (e.g. Bonfour, 2003). Traditional accounting, with a focus on historical costs and conservatism (e.g. Zeghal & Maaloul, 2011), has however not kept up the pace, resulting in an accounting impasse (e.g. Lev, 2018b). The major value creators are today, under IFRS, largely treated just like salaries - as having no future benefits - leaving a void in the balance sheet where

[4] International Financial Reporting Standards.

the intangibles are supposed to prevail. In their study, Chen, Cheng and Hwang (2005, p. 174) conclude that "[a]lthough generally-accepted accounting standards restrain most intellectual capital from being recognised in financial statements, investors still grasp the invisible value of intellectual capital." Yet, this does not imply that the financial accounting is in no need of improvement. The financial measures are still of great importance to the market (Cañibano, García-Ayuso & Sánchez, 2000), or further, a primary variable in an investors' analyses (Firer & Mitchell Williams, 2003; Ghosh & Wu, 2007). Not just that, balance sheets are meant to report a firm's assets, liabilities and equity at a given point in time. Lev (2003) provides several consequences of mismeasurement and deficient reporting of intangible assets. These include gains being misallocated to insiders, information deterioration (Lev & Zarowin, 1999) and systematic undervaluation of firms (García-Ayuso, 2003), meaning that this leads to the cost of capital becoming excessive. In their paper, Aboody and Lev (2000) found that in R&D-intensive firms, insider gains were four times larger than those to insiders in other firms. They conclude that R&D, thus, is contributing to information asymmetry, which is in line with Lev (2003). Likewise, the findings in Chan, Lakonishok and Sougiannis' (2001) study also support Lev (2003). The findings show a systematic undervaluation of R&D-intensive firms relative to other firms (Chan, Lakonishok & Sougiannis, 2001), which may be because intangibles are left out from the balance sheet. This is mostly noticeable among firms in the high-tech industries, such as information technology and healthcare. As of today, the balance sheet remains largely uninformative (Lev, 2018b), and the IASB calls for more research from the academic community for real progress to be made (Teixeira, 2014). The question to be answered is whether or not capitalised intangible assets fail to reflect the real value of the intangibles to stakeholders.

1.2 Aim

The objective of this study is to contribute to the field of accounting for intangibles under IFRS, answering to IASB's call for more research. This is done through studying the question whether or not capitalised intangibles, as seen in the balance sheet, still aid investors in making their estimates, or if the recognition of them lacks value relevance and is of little to no use in its current state. This study will therefore empirically investigate the relationship between firms' capitalised intangible assets and the dispersion of analysts' forecasted operating earnings, using Europe's listed firms in the healthcare industry as our sample (see 3.3 for the sample selection). Considering intangible assets being regarded as the main value drivers in today's intangible economy (see 1), as well as assuming the accounting is relevant and faithfully represented enough (see 2.2.1), a correlation between the capitalised intangible assets and the forecast estimates is to be expected, which might not be the case. We pose the following research question, acting as a proxy for the relevant and faithful representation of capitalised intangible assets:

- Is there a relation between capitalised intangible assets and operating earnings estimate dispersion?

1.3 Study outline

The study continues as follows. Section 2 first provides some background on mandatory IFRS for European firms and connects it to the academia. Thereafter the hypothesis is developed. Section 3 summarises the research design and the sample selection. Section 4 describes the data items and presents the empirical results. Section 5 discusses the empirical results, and section 6 concludes the findings and clarifies the limitations with this study. Section 7 gives thanks to those people whom have bestowed us their help.

2 Hypotheses development

In this section follows what intangible assets are and how they are reported under IFRS. Two standards are in focus: IAS 38 *Intangible Assets* as well as IFRS 3 *Business Combinations*. Thereafter follows a review of the literature from which the hypothesis emerges.

2.1 Intangible assets

An intangible asset is an identifiable non-monetary asset without physical substance (IFRS Foundation, 2004). IAS 38 provides examples of intangible assets covered in the standard (IFRS Foundation, 2004). These include, for example, software, advertising and customer lists[5].

Another intangible asset is goodwill, which is defined in IFRS 3 as an "asset representing the future economic benefits arising from other assets acquired in a business combination that are not individually identified and separately recognised" (IFRS Foundation, 2008, p. A163). Examples given in IFRS 3 (IFRS Foundation, 2008) are an assembled workforce and potential contracts, and in IAS 38, synergistic effects (IFRS Foundation, 2004).

Intangible assets can either be internally developed by the firm, gained as part of the acquisition of another firm, or purchased as individual assets. Internally generated means that they have been created within the firm's own operations, which can, for example, be done through marketing initiatives that strengthen the brand. (Marton, Lundqvist & Pettersson, 2018)

An intangible asset is identifiable if either of the following criterias are met. (IFRS Foundation, 2004)

i. It is separable from the firm, that is, it can be separated from the entity and sold, relocated, rented or exchanged, either individually or together with related contracts, identifiable assets or liabilities, regardless of whether the entity has this intention.
ii. It arises through legal or contractual rights, whether these are separable or transferable from the entity, other rights or obligations.

The recognition criteria is explained in IAS 38 as follows. An asset shall only be recognised if the following two statements are true (IFRS Foundation, 2004, p. A1347):

i. It is probable that the expected future economic benefits that are attributable to the asset will flow to the entity; and
ii. The cost of the asset can be measured reliably.

When it comes to measuring the cost of the asset reliably, IAS 38 only gives the guidance that "[a]n intangible asset shall be measured initially at cost" (IFRS Foundation, 2004, p. A1347). This lack in guidance, which may lead to an ineffective evaluation of the value of intangible assets, has significant implications for firms and investors, affecting them in many different ways (Aboody

[5] Note that not all items meet the recognition criterias.

& Lev, 2000; Boone & Raman, 2001; Shi, 2003). A market overvaluation, for example, of intangible-intensive firms may have big effects on investors as well as society at large, something the dot-com bubble in the late nineties and early 21st century is proof of (García-Ayuso, 2003). At the same time, an undervaluation could lead to the firm having problems raising capital in the market (García-Ayuso, 2003; Lev, 2003). Apart from the lack of guidance and conservative accounting standards, there exists some research claiming that financial reports fail to shed light on the processes that create value (Amir & Lev, 1996; Ittner & Larcker, 1998), resulting in misevaluations. García-Ayuso (2003) also claim that the management's prospect of the future financial situation is not always communicated to investors, suggesting there might be some kind of asymmetry in place, an asymmetry possibly less prevailing if the accounting standards had a different appearance. The prospect of some assets is easily valued, while some might demand a great amount of judgement (Shalev, Zhang & Zhang, 2013), implying that the less accurately a firm's value is reflected in the financial statements, the more additional disclosures will be needed. The judgement in valuation may also be influenced by management's own incentives to affect the outcome of their bonus programs, e.g. by selectively price allocate when calculating goodwill (Shalev, Zhang & Zhang, 2013). These findings are consistent with prior research (Healy, 1985; Holthausen, Larcker & Sloan, 1995) and suggest once again that there exists an information gap between management and the market.

2.1.1 The problem of information asymmetry

Information asymmetry stems from the fact that managers of a firm are the ones working directly with operations, meaning that they have good insight and can observe the profitability of made investments. Investors on the other hand are mostly users of highly aggregated information and have little to no insight into the rent creation of a single asset (Aboody & Lev, 2000). In their paper, Aboody and Lev (2000) find that the investor insight is worse in R&D intensive firms than in firms with more tangible assets, implying that information asymmetry is more prevalent in intangible-intensive firms. This is suggested to be due to different factors. One of them being the idiosyncratic nature of R&D. This uniqueness means that the probability of rent creation from this kind of asset is not dependent on visible external factors, in contrast to the way a general downturn in the property market would have a direct effect on a real estate firm. Other factors that contribute to the information gap are the lack of organised markets where such assets can be traded, as well as strict accounting rules which the firm has to follow in order to be able to capitalise R&D (IFRS Foundation, 2004).

When a firm sufficiently discloses the amount invested into any asset and its probable pay off, the cost of capital for said firm should be lower. The prediction would then be that the more intangible assets are capitalised onto the balance sheet, and prediction of future rent properly disclosed, the less information asymmetry would exist (Diamond & Verrecchia, 1991; Gu & Wang, 2003; Matolcsy & Wyatt, 2006). For the reasons mentioned above, this might not be possible. At the same time, there are companies with successful software products that systematically choose to expense the costs for software (Microsoft, Borland and Symantec are

such examples). Reasons for this could be that the companies do not view the amount as material, that they want to signal higher quality earnings to the market (Mohd, 2005) or that they perceive the disclosure cost of capitalising to be too great (costs of disclosing too much sensitive information or information that could risk litigation, would the estimated return never come) (Core, 2001).

Disregarding the reasons for not disclosing, one way to minimise the information asymmetry between firms and investors is for firms to provide information to the market. Castilla-Polo and Ruiz-Rodríguez (2017) have in their literature review gone over prior research done on the topic voluntary *IAD* (intangible asset disclosure). Earlier studies conducted show that there might have been a slight increase in IAD over the years. Yet, other studies show that IAD is becoming more stagnant and that firms are reporting it less. The results seems to be dependent on the underlying data, but the adoption of IFRS might also be affecting the results (Branco, Delgado, Sá & Sousa, 2010). Evidence that firm size is positively correlated with IAD is put forth by Kateb (2012), Nurunnabi, Hossain and Hossain, (2011) and Branco et al. (2010). Branco et al. (2010) suggest that this might be the case because bigger firms are more sensitive to political cost, and at the same time have an internal infrastructure that makes IAD more cost effective. This would mean that investors in smaller firms experience greater information asymmetry.

Firm characteristics other than size seems to affect the amount of voluntary IAD as well. Firms that are R&D intensive, for example, receive a lot more analyst attention compared to firms of low R&D intensity (Barth, Kasznik & Mcnichols, 2001). This might not necessarily be because the high intensive R&D firms do not disclose at all, but since the information of interest to analysts is not disclosed on the balance sheet. Similar observations are done by Tasker (as cited in Aboody & Lev, 2000) in her paper where she studies and measure the amount of conference calls a firm conducts. The results show that R&D intensive firms conduct far more calls relative to others, suggesting that the demand from investors on information about the business of these firms is high, presumably because of lacking information in the financial reports and the general complexity of R&D investments.

In short, information on intangible assets is not disclosed and intangible assets are not capitalised in the financial reports to the same extent as tangibles, suggesting an information asymmetry between the market and firms, which in turn would result in greater earnings forecast dispersion. Despite there being other ways to disclose information, most analysts still rely on the information in annual reports.

2.2 IASB's qualitative characteristics

2.2.1 Relevance and faithful representation

In order to make sure that financial information is useful, IFRS has set up guidelines on what qualities such information should have, so called *qualitative characteristics*. This is deemed important, since the quality is one of the most fundamental factors that could affect investors in their decision making (Deaconu, Buiga & Nistor, 2010; Kouki, 2018). One of these qualitative

characteristics, as described in the conceptual framework, is *relevance* (IFRS Foundation, 2010). IASB describes financial information as being relevant when it can affect decisions made by users. Relevant information has predictive or confirmatory value or both, where the first one implies that the information could be used to make a prediction and the latter one that the information provides feedback to a previous evaluation. One should note that relevance is not sufficient to make information useable, but there is also the characteristic of faithful representation and the enhancing qualitative characteristics *comparability*, *verifiability*, *timeliness* and *understandability* which all contribute to making the information useful (IFRS Foundation, 2010).

The second qualitative characteristic put forth by the IASB is, as mentioned, *faithful representation* (IFRS Foundation, 2010). The term replaced the previous term *reliability* in 2010 as a part of the joint framework revision, a part of the Norwalk agreement between IASB and FASB, in order to harmonise IFRS and US GAAP. The change has led to a term with less restraints on the use of fair value (Erb & Pelger, 2015). According to the IFRS' conceptual framework, faithful representation is defined as financial information being *complete, neutral* and *free from error* (IFRS Foundation, 2010).

2.2.2 Usefulness of accounting

Closely related to the term relevance and faithful representation is the term *value relevance* (Barth, Beaver & Landsman, 2001), meaning the ability of accounting information to explain the market value of a firm. This term is not stated in the conceptual framework, but is defined by the academia (Barth, Beaver & Landsman, 2001; Suadiye, 2012). There have been many studies made on this topic where the purpose has been to gather evidence of the reliability and relevance of accounting information in a market context (Brown, Lo & Lys, 1999; Lev & Zarowin, 1999; Chen & Zhang, 2007; Papadaki & Siougle, 2007), some of which have looked at the correlation between the equity price and the book value (Lev & Zarowin, 1999). Such studies have been conducted where the assets of interest are non-financial intangible assets. Tests have also been done to see whether or not the value of the assets are actually reflected in the cost of acquiring it. The hypothesis that the reported values does in fact not represent the real value of the assets is plausible due to the intrinsic nature of intangibles. The value of assets not traded on an open market, such as most intangible assets including goodwill, might only be assessable accurately at the date of the transaction (Barth, Beaver & Landsman, 2001). Another reason why there might be a gap between the book price and the market price is because of the conservativeness of accounting regulations, which results in most intangibles not being capitalised but instead expended right away. This is true in particular for knowledge-intensive firms (Oliveira, Rodrigues & Craig, 2010). Barth, Beaver and Landsman (2001) as well as Oliveira, Rodrigues and Craig (2010) summarise that studies on this topic, up until 2001, generally show that the value of some capitalised intangibles are relevant to investors and is reflected in the price of the firm's stock, with some reliability. There is, however, not a complete consensus that this is the case. Other studies have shown that relevance is low (Lev & Zarowin, 1999) and some studies show mixed results (Collins, Maydew & Weiss, 1997; Brown, Lo & Lys, 1999; Lev & Zarowin, 1999). Similar studies have been done on goodwill to see how

the market reacts to impairments. The prior results are conflicting as well, with Francis, Hanna, and Vincent (1996) reporting that the market does not react at all to announcements of impairment, while Bens, Heltzer, and Segal (2011) show that the market reacts negatively to such announcements. Despite the conflicting conclusions drawn, following the adoption of IAS and IFRS of European firms in 2005, there has generally been a sense of improvement in the transparency of, as well as the comparability between firms (Oliveira, Rodrigues & Craig, 2010).

The topic of value relevance is still of academic interest today, in part due to the fact that the main bulk of available studies discussing this topic were done before the European adoption of IAS and IFRS, while some have studied the hypothesised change in relevance due to the change from local GAAP to IFRS, where the conclusion has been that higher quality standards have lead to less dispersion in analysts' estimates (Bae, Welker & Tan, 2008; Byard, Li & Yu 2011; Chalmers, Clinch, Godfrey & Wei, 2012; Horton, Serafeim & Serafeim, 2013), which could be interpreted as lowering uncertainty. However, few to no studies have been made during recent years that have investigated the correlation between all intangible assets on the balance sheet of European firms and the dispersion of analysts' forecasted operating earnings. Yet today intangibles are as important as ever. The rationale of accounting figures is to provide investors with relevant information for their investment decisions (Dumontier & Raffournier, 2002), which in turn reduces information asymmetry, thus, the formulated hypothesis of this study is:

H1 The capitalised intangibles correlates with the dispersion of analysts' forecasted operating earnings.

3 Research design

3.1 Variable definition and measurement

To investigate the relation between capitalised intangible assets and operating earnings forecast dispersion, the following model was formulated:

$$LOG\_E\_DISP = \beta_0 + \beta_1 LOG\_INT + \beta_2 AGE + \beta_3 LEV + \beta_4 ICR +$$

$$\beta_5 ROI + \beta_6 RD\_EXP + \beta_7 NET\_INC + \beta_8 SIZE + \varepsilon$$

where:

LOG_E_DISP	= the standard deviation of earnings forecast (EBIT) divided by the mean forecast;
LOG_INT	= intangible assets divided by total assets ratio;
AGE	= logarithm of the age of the firm;
LEV	= long term debt divided by total equity;
ICR	= intellectual capital ratio (intellectual capital divided by market capitalisation);
ROI	= return on investment;
RD_EXP	= R&D expenses divided by net sales;
NET_INC	= net income divided by total assets;
SIZE	= market capitalisation (million USD); and
ε	= error term.

3.1.1 Dependent variable

A single variable was used as a proxy to observe whether or not capitalised intangible assets on the balance sheets fail to provide the information investors need, thus creating uncertainty: the standard deviation of the earnings estimates.

The building block chosen to represent the earnings estimate was EBIT. For this study, the specific measure was of less importance; what was of importance was that it is an earnings estimate, which then inevitably would take into account the information available (information on intangible assets). The standard deviation of the earnings forecasts represents the dispersion in the estimates, which accounts for all estimates done during the same time period, thus effectively taking into account the various number of estimates on a single firm, reflecting the information

uncertainty. The standard deviation has also been used as a measure of forecast dispersion in other studies (e.g. Parkash, Dhaliwal, & Salatka, 1995; Karamanou & Vafeas, 2005; Güntay & Hackbarth, 2010). The dispersion was then scaled by dividing it with the mean of the estimate, following Ajinkya and Gift (1985), Diether, Malloy and Scherbina (2002) and Johnson (2004). This was to account for the size effect.

A pre-test of the variables in the regression model was done. The residuals of the regression implied a violation of multivariate normality when illustrated by a Q-Q plot and a histogram (see Appendix 1). The variable E_DISP and INT (see 3.1.2) were therefore logarithmised, and the residuals plotted once again. A visual inspection showed a better normal distribution after the adjustments (see Appendix 2), indicating that more accurate estimates of the standard error can be made (Li, Wong, Lamoureux & Wong, 2012). The variable was operationalised as follows:

$$LOG\_E\_DISP = lg\left(\frac{Forecast\_STD}{Forecast\_Mean}\right)$$

3.1.2 Independent variable

To see if analysts recognise the value of firms' main value drivers, intangible assets, this study used the capitalised intangible assets to total assets ratio.

The rationale was as follows. On the basis of intangible assets being the main value driver in firms (see 1), it is only logical to expect them to take an important role in analysts' operating earnings forecasts. A ratio was chosen (instead of the actual amount capitalised intangible assets) as a proxy to capture whether or not enough intangible assets, for them to have an impact on the forecast, appear on the balance sheet. An intangible assets to total assets ratio has also been used in other studies, for example: Barth, Kasznik and Mcnichols (2001), Huyghebaert and Quan (2011), Sahut, Boulerne and Teulon (2011) as well as Boban and Susak (2017). The variable is simple, yet it still manages to capture the results of the accounting policies. The magnitude of capitalised intangible assets was of no interest in this study, but instead to which degree the intangible assets have been capitalised and thus appear in the balance sheet. E.g. it is of no interest whether or not a firm has capitalised intangible assets worth 100 or 1000. What is of interest is whether or not, out of the value of the total assets, a rightful proportion of the intangible assets have been capitalised[6]. Therefore, a ratio sufficiently acts as a proxy. The variable was logged (see 3.1.1) and operationalised as follows:

$$LOG\_INT = lg\left(\frac{Intangible\_Assets}{Total\_Assets}\right)$$

[6] The amount of intangible assets would presumably be more fit in a valuation-related study, to give one example.

Delta INT was also used, testing for the change in INT. This was done both with the percentage point change and the percentage change. This allowed additional analysis to be done on the main regression results. The variables were operationalised as follows:

$$\Delta INT\_PP = \frac{Intangible\_Assets_t}{Total\_Assets_t} - \frac{Intangible\_Assets_{t-1}}{Total\_Assets_{t-1}}$$

$$\Delta INT\_P = \frac{\frac{Intangible\_Assets_t}{Total\_Assets_t} - \frac{Intangible\_Assets_{t-1}}{Total\_Assets_{t-1}}}{Intangible\_Assets_{t-1} \,/\, Total\_Assets_{t-1}}$$

3.1.3 Control variables

This study applied three types of control variables, following the research design of Lang and Lundholm (1993), Oliveira, Rodrigues and Craig (2006) as well as Baroma (2013). They were as follows:

i. Structural variables, such as firm age, leverage and intellectual capital ratio;
ii. Performance variables, such as profitability, R&D expenses and net income; and
iii. Market variables, such as market capitalisation.

Findings on the relationship between the age of the firm and voluntary disclosures have been somewhat inconsistent. Sonnier, Carson and Carson (2009) found an inverse relationship between the level of intellectual capital disclosure and the age of a firm. Cordazzo (2007) found that the level of intangibles disclosure in IPOs is not significantly associated with firm age. Bukh, Nielsen, Gormsen and Mouritsen (2004) concludes that firm age does not affect the amount of intellectual capital disclosure. It is suggested that "younger and smaller companies will engage in intellectual capital disclosure in an effort to increase valuation and improve investor perceptions" (Sonnier, Carson & Carson, 2009, p. 5). It is also suggested that younger companies may suffer from competitive disadvantage and have higher costs of mandatory disclosures, resulting in older firms disclosing more information (Owusu-Ansah, 1998). Following Baroma (2013), the logarithm of the age of the firm was chosen, and this variable was operationalised as follows:

$$AGE = lg\_Age$$

Malone, Fries and Jones (1993) state that a high level of leverage (long term debt/equity for instance) may influence managers to disclose more information to meet the interests of long term creditors. Conversely, a low leverage may encourage disclosure targeted more toward shareholders. Mitchell Williams' (2001) study found a significant relation between leverage and the disclosed information. Hassan, Giorgioni and Romilly (2006) however found the level of voluntary disclosures to have a negative relation to leverage. Ho and Wong (2001) did not find any significant relation. Following Mitchell Williams (2001), Malone, Fries and Jones (1993), as well as Ho and Wong (2001), the variable was operationalised as follows:

$$LEV = \frac{Long\_Dept}{Total\_Equity}$$

The most common indicator of intellectual capital is the market-to-book value ratio (Stewart, 1997; Knight; 1999; Brennan & Connell, 2000), where the rationale is that the difference between the market value and the book value of a firm represents the firm's IC. The study conducted by Chen, Cheng and Hwang (2005) supports that firms' intellectual capital may be an indicator of future financial performance, as it is shown to have a positive impact on market value and financial performance. The same measure was used in Ghosh and Wu's (2007) study, where it was used as a proxy for how investors value a firm. One of the findings in their study is that IC is a significantly explanatory variable of firm value. The ratio used in this study was calculated as follows:

$$ICR = \frac{Market\_Value}{Total\_Assets}$$

According to Ghosh and Wu (2007), there is a relation between a firm's operating performance and investors' valuation of a firm's stock price. Therefore, one of the control variables chosen was ROI, calculated as the earnings before interests and income tax (EBIT) to total assets ratio. The measure satisfies Lev's (2001) three criterias for a variable with maximum usefulness. The variable was operationalised as follows:

$$ROI = \frac{EBIT}{Total\_Assets}$$

Research and development expenditures are in essence related to intangible assets, considering the fact that these are purely intangible assets which failed to be, or were chosen not to be, capitalised. The variable R&D expenditures to net sales was used here to measure a firm's effort toward R&D investments. According to Ghosh and Wu (2007), it serves as an indicator of the importance firms attach to their R&D activities. When it comes to firm valuation, studies display evidence that R&D expenses have a positive effect on firm value and profitability (Chen, Cheng & Hwang, 2005). The variable was operationalised as follows:

$$RD\_EXP = \frac{RDE}{Net\_Sales}$$

Voluntary disclosures are expected to have a positive relation with firm performance according to theoretical models. Political cost theory (Milne, 2002) supports the idea that firms have incentives to show the market the source of the profits, and thus disclose more. This is also consistent with signaling theory (Connelly, Certo, Ireland, & Reutzel, 2011), which suggests that profitable companies, in order to avoid undervaluation, will tend to disclose more. The analysis conducted by García-Meca, Parra, Larrán and Marínez (2005) supports the idea that the higher the

profits of a firm are, the more the firm will disclose, as to raise management compensation. Hassan, Giorgioni and Romilly (2006) concludes that more profitable firms disclose more information than less profitable ones. Oliveira, Rodrigues and Craig (2006) however, find no evidence of a relation between profitability and the voluntary disclosure of intangibles information. The evidence in prior empirical studies is therefore mixed. To account for the size effect, net sales was scaled using the same denominator as the independent variable. The proxy chosen for profitability was operationalised as follows:

$$NET\_INC = \frac{Net\_Sales}{Total\_Assets}$$

The variable firm size is the most commonly used independent variable in studies of accounting disclosure. Studies in Australia (Brüggen, Vergauwen & Dao, 2009), Bangladesh (Nurunnabi, Hossain & Hossain, 2011), France (Depoers, 2000), Hong Kong SAR (Wallace & Naser, 1995), Italy (Bozzolan, Favotto & Ricceri, 2003), New Zealand (Hossain, Perera & Rahman, 1995), Portugal, (Oliveira, Rodrigues & Craig, 2006), Spain (García-Meca, Parra, Larrán & Marínez, 2005), Sweden (Cooke, 1989; Beaulieu, Williams & Wright, 2002) and the USA (Singhvi & Desai, 1971), among some, have found a significant positive relation between firm size and the extent of voluntary disclosures. Aboody and Lev (2000), however, suggest that capitalising firms are growth firms, where the earnings are harder to predict than for expensing firms. Proxies commonly used for firm size are total assets, turnover and market capitalisation (Oliveira, Rodrigues & Craig, 2006). This study used market capitalisation, following many previous studies (e.g. Lang & Lundholm, 1993; Wallace & Naser, 1995; Bozzolan, Favotto & Ricceri, 2003; García-Meca, Parra, Larrán & Marínez, 2005). The variable was operationalised as follows:

$$SIZE = Market\_Cap$$

3.1.4 Expected signs of the variables

The control variables were expected to have an impact on the results for two reasons. Either they would directly influence the estimate done by analysts (e.g. return on investment), or act as a sign of more voluntary disclosures on intangible assets existing in the financial reports, thus aiding the analyst in the valuation of the intangibles (e.g. size). By accounting for these, the risk of a spurious correlation between capitalised intangible assets and the dispersion of analysts' forecasted operating earnings was expected to be minimised.

The independent variable (intangible assets to total assets ratio) was expected to have a significant relation to the dependent variable, indicating that consideration was being taken to capitalised intangibles. This was because intangibles are the main value drivers in firms (see 1), and thus ought to play a major role in operating earnings forecasts. The relation between the variables, being positive or negative, is explained in Table 1.

Table 1
Variable relation explanation.

	Relation
Intangible capitalisation: *(INT)*	The higher intangible intensity, the easier (-), or the more difficult (+), forecasting is.
Voluntary disclosures: *(AGE, LEV, NET_INC, SIZE)*	The more voluntary disclosures are provided, the easier (-), or the more difficult (+), forecasting is.
Expensing: *(RD_EXP)*	The more expensed R&D, the easier (-), or the more difficult (+), forecasting is.
IC: *(ICR)*	The less intellectual capital, the easier (-), or the more difficult (+), forecasting is.
Performance: *(ROI)*	The higher performance, the easier (-), or the more difficult (+), forecasting is.

Note that an increase in ICR implies that the gap between intellectual capital and total assets becomes smaller, and thus intellectual capital decreasing.

3.2 Source of data

All data used in this study was obtained from the database S&P Capital IQ, a private database maintained by Standard & Poor's. Access to the database was granted through the University of Gothenburg.

3.3 Research sample

This study focused on firms listed in Europe in the healthcare industry for several reasons. First, one individual industry was chosen as to avoid inter-industry variations, following the study done by Ghosh and Wu (2007). Second, previous studies (e.g. Kang, 2006; Oliveira, Rodrigues & Craig, 2006; Ghosh & Wu, 2007; Sonnier, 2008; Brüggen, Vergauwen & Dao, 2009; Sonnier, Carson & Carson, 2009; Nurunnabi, Hossain & Hossain, 2011) have shown that there is a relation between firms operating in the high-technology sector and the voluntary disclosures of intangibles. An industry in the high-technology sector was therefore chosen as to account for voluntary disclosures of intangible assets and intellectual capital commonly being available, possibly affecting analysts' estimates. These disclosures were then taken into considerations through the control variables (see 3.1.3). Third, the high-technology sector was chosen because forecasts have been found being more accurate for firms in this sector relative to the low-technology sector, as a result of more accurate information being available for these firms (Kwon, 2002). Fourth, the sector was also chosen because of the fact that firms in that sector tend to have more intellectual capital, as they are more knowledge-intensive. Lastly, the sector was chosen because reported GAAP numbers have shown to be less value-relevant for high-technology firms than for low-technology firms due to the accounting conservatism of intangibles (Wyatt, 2008). For the above stated reasons, the healthcare industry was chosen, thus putting the balance sheet to a stress test.

Listed European firms were chosen as the sample. As of January 1st, 2005, these firms have adopted IFRS when preparing their consolidated financial statements.

A multi-year analysis was done in order to increase the amount of firm years, as well as to minimise the risk of irregularities occuring one specific year.

The sample began with all listed firms in Europe during 2005-2018 in the healthcare industry, consisting of 196 034 firm-years. After adjusting for industry, firms missing data on the

selected variable and outliers, the final sample consisted of 734 firm-years. Table 2 illustrates the sample selection in Panel A, as well as the sample distribution by year in Panel B and the sample distribution by intangible intensity and market capitalisation in Panel C. The study thus has a large test sample, allowing for generally applicable conclusions to be drawn.

Table 2
Sample selection and distribution.

Panel A: Sample selection.

	Firm-years
Listed firms during 2005-2018	196 034
Less: firms not in the healthcare industry	-177 325
Less: firms missing data	-17 910
Less: outliers	-49
Final sample	734

Panel B: Sample distribution by year.

Year	Firm-years	Percentage of sample	Year	Firm-years	Percentage of sample
2005	21	2,8	2012	55	7,5
2006	41	5,6	2013	53	7,2
2007	48	6,5	2014	61	8,3
2008	48	6,5	2015	61	8,3
2009	44	5,9	2016	64	8,7
2010	51	6,9	2017	62	8,4
2011	60	8,2	2018	65	8,6
			Final sample	734	100

Panel C: Sample distribution by intangible intensity and market capitalisation.

Intangible intensity (%)	Firm-years	Percentage of sample	Market cap (billion USD)	Firm-years	Percentage of sample
0-10	135	18,4	0-1	136	18,5
10<-20	116	15,8	1-5	166	22,6
20<-40	235	32,0	5-10	78	10,6
40<-60	169	23,0	10-50	185	25,2
60<-80	79	10,8	50-100	86	11,7
80<-100	0	0	100+	83	11,3
Final sample	734	100		734	100

The outliers in the sample selection, Panel A, were accounted for by a 99% trim, excluding variables not within the 0,5th and 99,5th percentile.

3.4 Model adjustments

The results from a VIF[7]-test (Kutner, Nachtsheim, Neter & Li, 2004) on the regression model showed a high risk for multicollinearity between the variables ROI (6,86) and NET_INC (6,69), with a mean total of 2,60. Left untreated, this may result in variable significances being distorted, variances increased and parameter signs twisted (O'brien, 2007). The variable ROI, with the highest value, was thus removed, reducing NET_INC to 1,10 and the mean to 1,19.

[7] Variance inflation factor.

4 Empirical findings

4.1 Descriptive statistics

Table 3 presents descriptive statistics for the sample. Considering that logarithmised values are difficult to interpret, the base variables are provided and discussed. The variable INT shows that an average sample firm has approximately 32% intangible assets, indicating a positive skewness in intangible intensity. The SIZE variable indicates a positive skewness as well, considering the mean, min and max values. The wide range in market capitalisation suggests that the firms in the sample are spread across the sizes small, mid and large. The E_DISP value constitutions are illustrated in the following, using the raw data from the sample: min $\left(\frac{2,5}{1527,5} \approx 0,002\right)$, median $\left(\frac{16,2353}{375,134} \approx 0,043\right)$ and max $\left(\frac{4,565}{2,583} \approx 1,767\right)$, whereas the numerator is the forecast standard deviation, and the denominator is the forecast mean. As is seen, the dispersion was successfully scaled.

Table 3
Variable summary statistics.

	Sample (n = 691)			
	Mean	sd	min	max
LOG_E_DISP	-3,199	0,951	-6,415	0,569
E_DISP	0,067	0,117	0,002	1,767
LOG_INT	-1,459	1,017	-5,844	-0,237
INT	0,325	0,201	0,003	0,789
AGE	1,695	0,357	0,477	2,228
LEV	0,365	0,419	0,000	3,839
ICR	2,409	1,832	0,268	15,390
RD_EXP	0,854	1,409	-7,116	11,779
NET_INC	0,083	0,089	-0,930	0,389
SIZE	36045,600	54217,640	4,874	347984,900

The variable SIZE is expressed in million USD. Neither E_DISP nor INT were part of the regression.

The correlation matrix in Table 4 displays the degree of the relationship between linearly related variables. The analysis shows that LOG_E_DISP is negatively correlated with LOG_INT, AGE, LEV, NET_INC and SIZE, suggesting that forecast dispersion is negatively associated with factors that have previously been shown to decrease it, following previous studies, and negatively[8] correlated with intangible intensity. Furthermore, no significant relationship is found between LOG_E_DISP and ICR or RD_EXP.

[8] As INT approaches 1, implying 100 % intangible assets, LOG_INT increases, approaching 0 from the negative. As E_DISP increases, LOG_E_DISP increases as well. LOG_INT having a negative relation to LOG_E_DISP therefore implies that when the variable LOG_INT increases (the intangible intensity increases), LOG_E_DISP decreases (E_DISP decreases).

Table 4
Correlations.

Panel A: Pearson correlations between the dependent and independent variables.

	LOG_E_DISP	LOG_INT	AGE	LEV	ICR	RD_EXP	NET_INC	SIZE
LOG_E_DISP	1							
LOG_INT	-0,103***	1						
AGE	-0,145***	0,123***	1					
LEV	-0,132***	0,243***	0,088**	1				
ICR	0,005	-0,412***	-0,296***	-0,186***	1			
RD_EXP	0,058	0,036	0,024	0,006	0,023	1		
NET_INC	-0,236***	-0,230***	0,083**	-0,079**	0,240***	0,009	1	
SIZE	-0,116***	0,118***	0,364***	0,129***	0,057	0,091**	0,148***	1

The significance is denoted by * (0,1), ** (0,05) and *** (0,01) respectively.

4.2 Regression results

Table 5, Panel A, shows the results of two regressions. Both regressions, without the country effect (with the country effect), will now be commented on. Considering the logarithmised E_DISP, INT and AGE variables, the implication of LOG_INT and AGE's coefficients differs slightly from the rest. LOG_INT is shown to be statistically significant at $\alpha = 0{,}01$ ($\alpha = 0{,}05$), implying a decrease of roughly 0,13 (0,10) % in E_DISP at a 1 % increase in INT (UCLA, n.d.; Ford, 2017). When accounting for country fixed effects, the coefficient of LOG_INT is slightly weaker, but still significant. AGE, LEV and NET_INC are all showed to be statistically significant, where NET_INC showed a slight weaker significance and ICR instead became significant after accounting for country fixed effects. AGE implies an increase in firm age of 1% will lead to a decrease in E_DISP with 0,28 (0,64) %, similar to the relationship between INT and E_DISP. Furthermore, the LEV and NET_INC coefficients needs to be transformed to be intuitively understood. For every *one-unit* increase in LEV[9], E_DISP would decrease 23,35 (25,70) %[10]. A one-unit increase in NET_INC[11] brings a decrease in E_DISP of 93,27 (91,81) %. These two relations follow what has been suggested (see 3.1.3), that more profitable firms, and firms with higher leverage, tend to disclose more, which would decrease information uncertainty. RD_EXP was found to not have any statistically significant effect on the dispersion of analysts' forecasted operating earnings, in contrast to what has been shown in previous studies (see 2.1.1), implying that analysts do not take the intangible assets outside the balance sheet into account. On the contrary, when accounting for country fixed effects, the variable ICR was significant, which in turn suggests that investors in fact do make use of the non-capitalised intangible assets. However, the negative correlation still points towards the less intellectual capital, the lower information uncertainty exists and thus lower estimate dispersion.

[9] Whereas 1 indicates long term debt and total equity are equal, and 2 would indicate long term debt being twice the amount of total equity.

[10] [(e raised by the coefficient) - 1] * 100 = the change in the dependent variable in percent after a one-unit increase in the dependent variable. (UCLA, n.d.; Ford, 2017)

[11] Whereas the value 1 implies net sales and total assets being equal, and 2 that net sales are twice the amount of the total assets.

The results in Table 5, Panel A, are statistically significant, thus the null hypothesis can be rejected, suggesting that there is a relation between capitalised intangible assets and the dispersion of analysts' forecasted operating earnings, both with and without consideration taken for country fixed effects. The relation is found to be negative, suggesting that analysts' operating earnings forecast dispersion decreases with an increase in intangible intensity.

Table 5
Test of hypothesis

Panel A: Regression results, testing the correlation between estimate dispersion (logarithmised) and intangible intensity (logarithmised).			
Variable: LOG_E_DISP	Incl. COUNTRY	Excl. COUNTRY	
LOG_INT	-0,097** (-2,37)	-0,129*** (-3,18)	
AGE	-0,638*** (-5,50)	-0,280*** (-2,66)	
LEV	-0,297*** (-4,28)	-0,266*** (-3,42)	
ICR	-0,052** (-2,08)	-0,028 (-1,11)	
RD_EXP	0,035 (1,49)	0,033 (1,27)	
NET_INC	-2,502*** (-4,93)	-2,699*** (-5,48)	
SIZE[12]	0,000 (0,10)	-0,000 (-0,51)	
Intercept	-1,631*** (-6,20)	-2,541*** (-12,44)	
R-sq	*0,208*	*0,109*	
N	*691*	*691*	
Panel B: Test of multivariate normality.			
		Prob>chi2	
Doornik-Hansen		0,000	
Panel C: Test of multicollinearity.			
	Mean	min	max
Multicollinearity	1,190	1,020	1,390

Panel A shows results from the regression. The test was done both with and without taking into consideration country fixed effects. The coefficients are displayed for each variable with the t-value in parenthesis. The significance is denoted by * (0,1), ** (0,05) and *** (0,01) respectively. Panel B displays the result of the Doornik-Hansen test, performed on the test excluding country fixed effects, which tests for multivariate normality (Doornik & Hansen, 2008). Panel C provides results from the test of multicollinearity (Jaggia & Kelly, 2012), performed on the test excluding country fixed effects. The lowest VIF relates to RDE_EXP and the highest to ICR.

4.2.1 Change specification test

Table 6 shows the regression results from the change specification tests. The first one tested the percentage point change in INT, and the second one tested the percentage change. The second test showed a significant relation between the independent and the dependent variable, which suggests that not just greater intangible intensity lowers the dispersion of analysts' forecasted operating earnings, but also a percentage increase. The first test, however, did not find this relation.

Table 6
Test of hypothesis, delta

Panel A: Regression results, testing the correlation between estimate dispersion (logarithmised) and delta intangible intensity.		
Variable: LOG_E_DISP	Percentage points	Percentage
ΔINT	-0,190 (-0,46)	-0,040*** (-7,30)
AGE	-0,273** (-2,53)	-0,268** (-2,49)
LEV	-0,312*** (-3,86)	-0,317*** (-3,92)
ICR	-0,005 (-0,20)	-0,020 (-0,92)
RD_EXP	0,039 (1,50)	0,039 (1,49)
NET_INC	-2,511*** (-5,06)	-2,493*** (-4,89)
SIZE	-0,000 (-1,00)	-0,000 (-0,97)
Intercept	-2,415*** (-11,21)	-2,393*** (-11,18)
R-sq	*0,096*	*0,106*
N	*687*	*687*

Panel A shows results from the regressions. The tests were done without taking into consideration country fixed effects. The coefficients are displayed for each variable with the t-value in parenthesis. The significance is denoted by * (0,1), ** (0,05) and *** (0,01) respectively.

[12] Observations of SIZE are denoted in million USD, which results in very low correlation coefficients in the regression.

4.2.2 Robustness tests

Several tests were made to assess the accuracy of the regression results for the main test (excluding country fixed effects). Table 5, Panel B, displays the results from the Doornik-Hansen test, suggesting that multivariate normality is not present. There are therefore variables diverging strongly from normal distribution. The residuals, however, appear normally distributed when visually inspected (see Appendix 2). Multicollinearity was tested, and as can be seen in Panel C, there is no indication of such, implying that valid results about any individual predictor may be given. The regression was done with robust standard errors, accounting for potential heteroscedasticity, suggesting constant predicting power. Autocorrelation was not tested, considering the sample being scattered across both time and firms. Lastly, linear relationships between the dependent and each of the independent variables were visually inspected using scatterplots. No nonlinear relationships were found (see Appendix 3). On this basis, the regression results have a rather strong statistical accuracy.

Additional regressions done, using the exact same model but on different industries, test whether or not the results are only seen when testing intangible intensive firms. The results are presented in Table 7. LOG_INT is shown to be negatively significant in both the industry information technology and consumer discretionary, similar to the results in Table 5, however the intangible intensity in consumer discretionary is half of the one in healthcare. These results point toward more general conclusions being able to be drawn. LOG_INT was, however, not found to be significant in real estate, which speaks for the opposite. On the other hand, the sample size in the real estate industry is rather small, and thus not necessarily very accurate nor comparable. To account for this, 366 observations were randomly tested from the industries information technology and consumer discretionary. The results from the first test showed LOG_INT (***) and NET_INC (***) both negatively significant. The results from the second test showed LOG_INT (***), AGE (***), LEV (**) and NET_INC (***) all negatively significant. The same conclusions can thus be drawn.

Table 7
Test of other industries

Panel A: Regression results, testing the correlation between estimate dispersion (logarithmised) and intangible intensity (logarithmised) in other industries.			
Variable: LOG_E_DISP	Information technology	Consumer discretionary	Real estate
LOG_INT	-0,235*** (-9,26)	-0,119*** (-6,36)	0,024 (0,96)
AGE	-0,290*** (-2,71)	-0,604*** (-6,93)	-0,043 (-0,23)
LEV	0,007 (0,23)	-0,026*** (-2,87)	-0,063 (-0,37)
ICR	-0,011* (-1,83)	-0,034 (1,11)	-0,588*** (-3,97)
RD_EXP	-0,005 (-0,69)	0,090** (2,49)	(omitted)
NET_INC	-4,373*** (-9,63)	-3,090*** (-4,76)	0,376 (0,61)
SIZE	0,000 (1,30)	0,000 (0,79)	0,000* (4,46)
Intercept	-2,545*** (-13,62)	-2,204*** (-13,08)	-2,254*** (-7,34)
R-sq	*0,156*	*0,123*	*0,050*
N	*1187*	*1113*	*366*
Intangible intensity	*0,216*	*0,166*	*0,057*

Panel A shows results from the regressions. The tests were done without taking into consideration country fixed effects. The coefficients are displayed for each variable with the t-value in parenthesis. The significance is denoted by * (0,1), ** (0,05) and *** (0,01) respectively. Intangible intensity is measured as the mean intangible ratio of all firms in the sample. RD_EXP omitted in real estate sample due to data missing on expended R&D.

5 Discussion

5.1 Information asymmetry

Intangible assets in firms are viewed differently depending on their origin, and only the purchased ones are the ones visible on the balance sheet (Marton, Lundqvist & Pettersson, 2018). This together with a lacking guidance in valuation leads to information asymmetry to prevail already from the start. Despite this, the regression results found investors to be using the capitalised intangibles when making their estimates, suggesting that the evaluation of intangible assets is more effective, and the problems less acute, than what might have been assumed (Amir & Lev, 1996; Ittner & Larcker, 1998; Aboody & Lev, 2000; Boone & Raman, 2001; Shi, 2003). Whether or not there is a risk for another dot-com bubble (García-Ayuso, 2003), or if intangible intensive firms have difficulties raising capital (García-Ayuso, 2003; Lev, 2003), the empirical results points towards the risk and problem not being critical, but in a ([an] at least slightly) better state than what has previously been suggested in e.g. Chan, Lakonishok and Sougiannis (2001) and Lev (2018b). The balance sheet, thus, to some extent, manages to shed light on the value creators.

Intangible assets, however, require a great amount of judgement when valued before entering the balance sheet (Shalev, Zhang & Zhang, 2013), and the communication of the management's prospects is often deficient (García-Ayuso, 2003). Following the rationale that the less accurately a firm's value is reflected in the financial statements, the more voluntary disclosures will be needed for correct estimations to be made, the results from this study points towards the evaluation not being perfect. Age (Owusu-Ansah, 1998), leverage (Malone, Fries & Jones, 1993; Mitchell William, 2001) and profitability (Hassan, Giorgioni & Romilly, 2006) have all been shown, in previous studies, to be significantly correlated to the prevalence of voluntary disclosures. The fact that these variables have a statistically significant relation to the dispersion of analysts' forecasted operating earnings makes it logical to draw the conclusion that the balance sheet yet has room for improvements, considering voluntary disclosures seemingly still being necessary to make the estimates, which in turn is something that might be influenced by management's own incentives (Shalev, Zhang & Zhang, 2013). Voluntary disclosures can be understood as a consequence of an imperfect accounting system, such as a remedy for information uncertainty, whereas they would not be needed assuming the value of a firm is correctly displayed. Therefore, what it comes down to is a lack of insight, where investors often lack insight into the rent creation, especially in R&D intensive firms (Aboody & Lev, 2000), firms that frequently lack sufficient information of interest in their balance sheets, and small firms (Kateb, 2012). The results suggest that the accounting rules are, indeed, strict; and the fact that intangible assets often lack organised markets, as well as the rent creation being dependent on factors not visible, is embodied in the statistically significant control variables reflecting the disclosures.

It is suggested that a correct amount of additional capitalisation leads to less information asymmetry (Diamond & Verrecchia, 1991; Gu & Wang, 2003; Matolcsy & Wyatt, 2006). Although some firms still choose to provide less voluntary disclosures, be it to signal higher

earnings (Mohd, 2005) or because of high disclosure costs (Core, 2001), the regression results are in line with what is suggested. An increase in intangible intensity, implying additional capitalisation, is shown to decrease the dispersion of analysts' forecasted operating earnings, which is in line with previous studies (Diamond & Verrecchia, 1991; Gu & Wang, 2003; Matolcsy & Wyatt, 2006). This does, of course, not imply that capitalising every intangible asset possible would decrease information uncertainty, considering that they might not be value relevant. If nonrelevant information makes its way onto the balance sheet, this might imply lower value relevance.

The discussion above is illustrated in Figure 2. The regression results propose that more capitalisation of intangible assets would lower information uncertainty, suggesting that the current accounting of intangible assets is on the left side of the curve. Considering the fact that a significant relation between LOG_INT and LOG_E_DISP was found, the balance sheets have some value relevance in their current state, implying that the current accounting of intangible assets is not in the leftmost tail. The results from the change specific regression (see Table 6) strengthens the claim that there are still additional value relevant intangibles which may be capitalised, suggesting that further capitalisation would lower information asymmetry. What's more, investors still need the voluntary disclosures, and the regression results from the main regression (see Table 5) showed a negative relation. These three findings imply that there are still value relevant intangible assets which have not been capitalised.

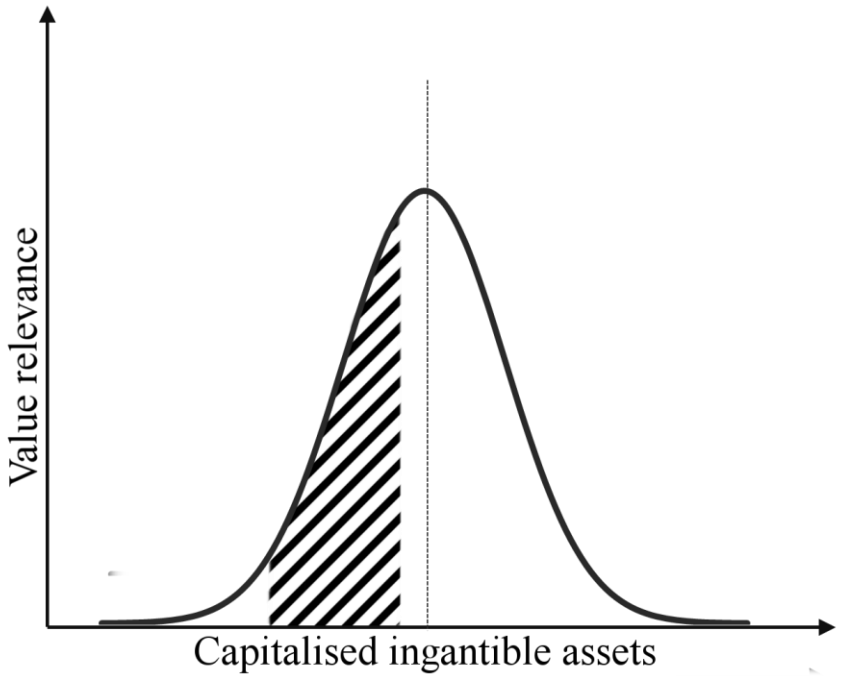

Figure 2. *A theorised relationship between value relevance in accounting information and capitalised intangible assets.*

The hypothesis that the reported value in fact does not represent the real value of the asset is plausible due to the intrinsic nature of intangibles. The evaluation does possess some effectiveness, thanks to light being shed on the value drivers. It is, however, not perfect, which the

seeming need for more voluntary disclosures suggest. Information asymmetry is shown to exist, but leastwise additional value relevant capitalisation provide investors with useful information, reducing information asymmetry.

5.2 Usefulness of accounting

In order for accounting to be considered useful, it has to be qualitative (Deaconu, Buiga & Nistor, 2010; Kouki, 2018), something the IASB describes, among other things, as being relevant when making financial decisions (Dumontier & Raffournier, 2002), as well as having predictive value (IFRS Foundation, 2010). With this in mind, the results from the regression models show that intangible assets are indeed reported in a qualitative, or at least value relevant way, as they are shown to significantly affect the estimate dispersion in a negative way. These finding are consistent with prior research on value relevance, conducted after the implementation of IFRS (Bae, Welker & Tan, 2008; Byard, Li & Yu 2011; Chalmers, Clinch, Godfrey & Wei, 2012; Horton, Serafeim & Serafeim, 2013), but since the sample years of this study are only between 2005-2018, no claim can be made on the relative value relevance compared to the time before IFRS. Nevertheless, the results support earlier findings (Barth, Beaver & Landsman, 2001; Oliveira, Rodrigues & Craig, 2010) but does contradict the findings of Lev and Zarowin (1999). Apart from this, the shown inversive relationship between intangibles and the dispersion of analysts' forecasted operating earnings could be due to a functioning transparency in the financial reports, something Oliveira, Rodrigues and Craig (2010) suggest came about after the implementation of IFRS and IAS, which would have made financial information more trustworthy. However, this phenomenon is not shown in the expensed R&D, which might suggest that capitalisation of intangible assets is of more usefulness to analysts than expensed ones, and expensed R&D thus not taken into account, despite previously being linked to a firm's profitability (Chen, Cheng & Hwang, 2005). Another interpretation is that the amount of R&D expensed is not enough to be material, and thus does not affect the valuation at all.

If the gap between the book price and market price of a firm points in the direction of there being a problem valuing said firm, as suggested by Lev (2018b), then knowledge intensive firms, such as the ones in this sample, are suggested to suffer a lot from this (Oliveira, Rodrigues & Craig, 2010), since the conservativeness of accounting standards forces firms to expense intangible investments right away, investments that can be assumed to be of use to the firm. A conclusion that can be drawn from this could be that less conservativeness in accounting regulation on intangibles could increase the strength of the correlation between LOG_INT and LOG_E_DISP, on the basis of additional capitalisation being value relevant.

Despite there being different conclusions drawn in previous studies on the topic of the usefulness of intangible assets, results from the regressions show that reported intangible assets do indeed aid investors, suggesting that the reported intangible assets are value relevant and that capitalising more would increase value relevance.

6 Conclusions

This study addresses the problem with accounting for intangibles, answering the question whether or not capitalised intangible assets, as seen in the balance sheet, still aid investors in making their estimates, or if the recognition of them is of little to no use in its current state. An empirical investigation of the relationship between firms' capitalised intangible assets and the dispersion of analysts' forecasted operating earnings suggest that analysts, in fact, do make use of the reported intangible assets when making their estimates. The results do also show that additional capitalisation is of use to analysts. The intrinsic nature of intangibles makes the reported value not representing the intangibles real value, however some effectiveness, although not perfect, in the valuation is shown to exist. Information asymmetry is a prevailing phenomenon, suggested to be reduced with additional capitalisation of intangible assets. The overall results imply that the reported intangible assets are value relevant and do aid investors (despite the accounting conservatism), implying that IFRS have some value relevance when it comes to the accounting of intangibles. The policy implication from this study, however, points toward not enough intangibles being reported to create maximum value relevance.

6.1 Contributions

This study contributes to prior research in accounting for intangibles under IFRS, answering to IASB's call for more research. Few studies have been done after 2005 that analyses data over a long, post IFRS, period of time. The study could have implications for firms as well when trying to understand what information the market actually uses to evaluate their stock. This could aid them when deciding on what information to disclose, and which assets to fuse into the balance sheet. The results also contribute to the study on intellectual capital in the sense that they might make narrowing down the problems with the current accounting standards easier.

6.2 Limitations

The authors of this study acknowledge several limitations inherent to this study. First, the conclusion is evidently a result of the chosen variables and the treatment of the same. A different set of variables may have resulted in a different outcome. Second, the robustness tests hinted towards a different result in the real estate industry, with hardly any to no capitalised intangible assets. Although the real estate sample was small, and no other industries with as few intangibles capitalised were tested, there is a possibility that the results are only applicable on intangible intensive firms. Third, results from the chosen time span might be affected by macroeconomic influences, unknown at the time of writing. Lastly, the relationship suggested in Figure 2 might not be valid for all firms. There may exist firms which have already reported enough intangible

assets to create maximum value relevance for investors. The results from this study would thus not apply to these firms, but has been shown to be applicable for the sample as a whole.

6.3 Future research

Although there are limitations to generalising results based on a study inherent with above stated limitations, this study does provide a few implications for possible future research. The study suggests that analysts, in fact, do utilise capitalised intangible assets on the balance sheet, contradicting the critique on the usefulness of IFRS by both Lev and Dichev, suggesting that the accounting for intangibles is value relevant in its current state. What would be of additional value is further research being done, measuring *how* value relevant the accounting for intangibles actually is, and whether or not that amount is enough in an accounting point of view to be deemed faithfully represented.

Second, future studies using a different proxy than operating earnings estimates could benefit IASB's work, considering the fact that analysts mostly observe large companies. This to prove whether or not these results are applicable in a wider domain.

Third, additional studies should be made to test whether or not there exist firms which have reported enough intangible assets to create maximum value relevance for investors. This would strengthen, or weaken, the claim that intangible assets are not reported to the extent which investors want, which would contribute to the field of accounting for intangibles under IFRS.

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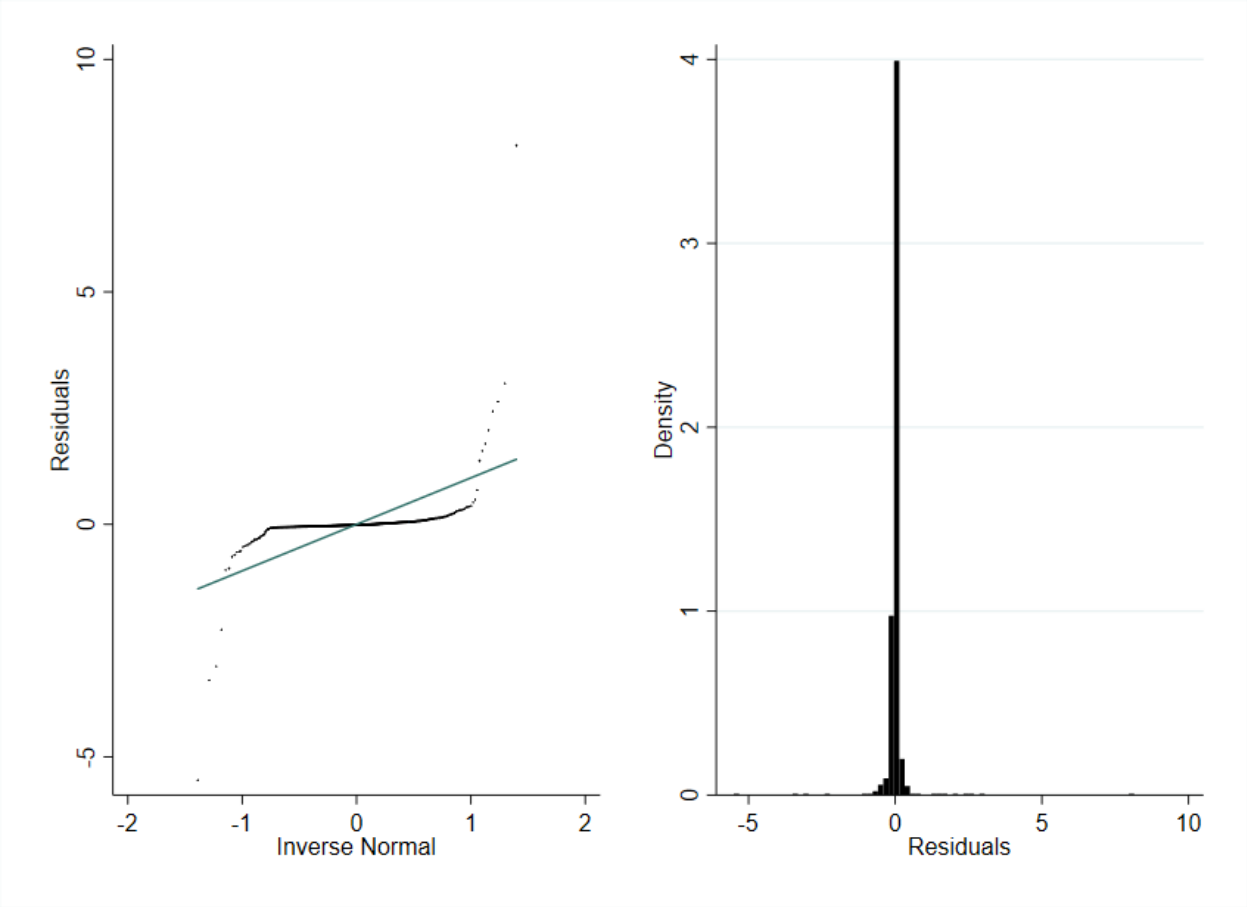
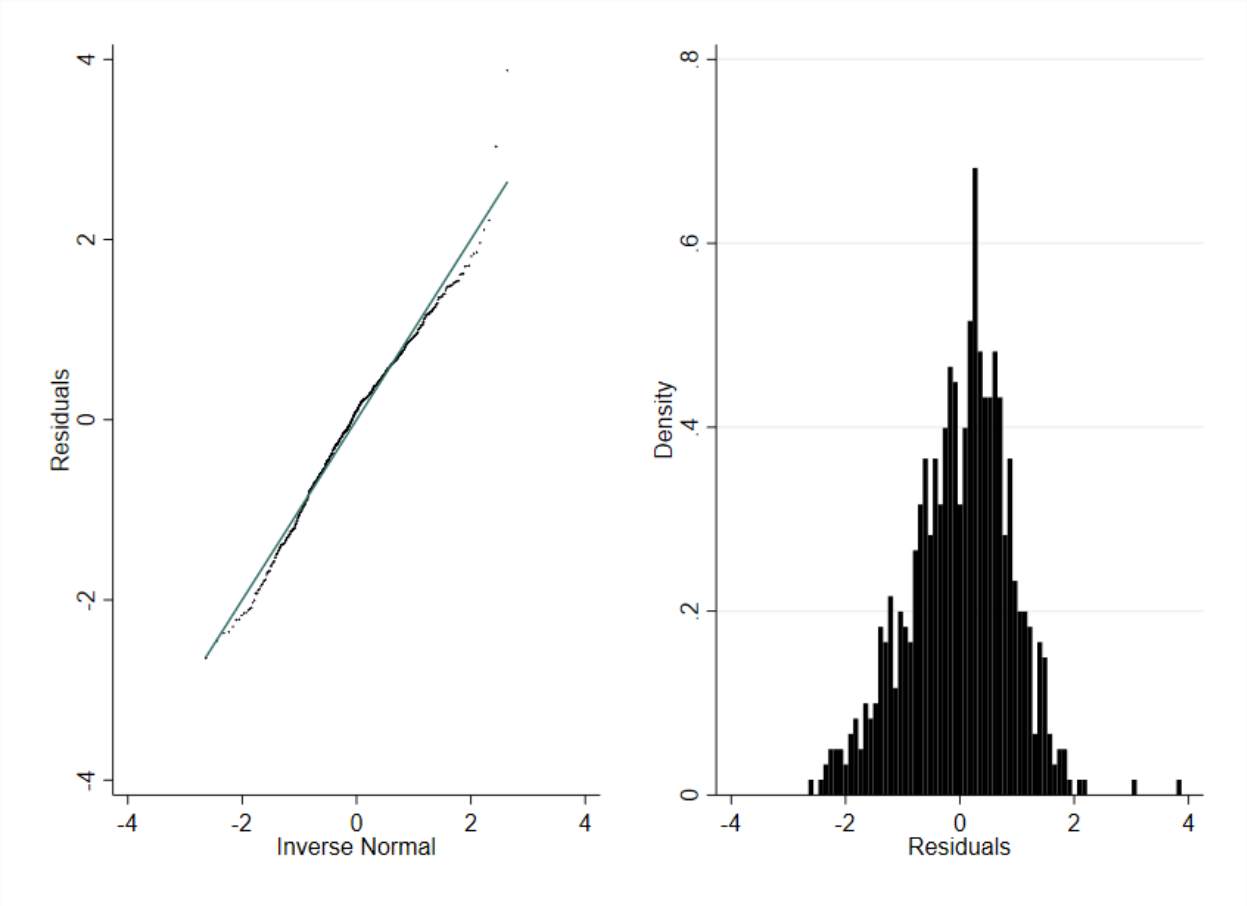
Appendix

1 Residual distribution before logarithmisation



2 Residual distribution after logarithmisation



3 Linear relationships