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How is goodwill impairment driven by relative firm performance?
Evidence from Germany

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How is goodwill impairment driven by firm performance?

Evidence from Germany

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ABSTRACT

Goodwill treatment has been facing considerable changes in terms of regulation. More recently, IAS 36 (2004) develops the subject of impairment of assets, stating that goodwill should be subject to impairment tests on an annual basis. In the IFRS context, the present research study aims at investigating how goodwill impairment is driven by relative firm performance in Europe, using Germany evidence. More precisely, the paper focuses on two distinct analyses: comparing differences between impairment and non-impairments firms (cross-sectional analysis) and impairment and non-impairment years (longitudinal analysis). Using both *t*-tests and Wilcoxon Rank Sum statistical tests, findings partially support the hypothesis that impairment firms are significantly less efficient when compared to non-impairment firms in the period of goodwill impairment recognition. However, results of the longitudinal analysis do not support the hypothesis that Germany firms are relatively less efficient in the year of goodwill impairment comparing to the year of no impairment. These results are in line with similar studies applied to the United States and US GAAP. Finally, based on the longitudinal analysis' findings, the earnings management topic is briefly discussed.

Keywords: International Financial Reporting Standards (IFRS); goodwill; goodwill impairment; relative firm performance; earnings management; Germany

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RÉSUMÉ

Le traitement du goodwill a été confronté à des changements considérables en termes de réglementation. Plus récemment, la norme IAS 36 (2004) développe le sujet de la dépréciation des actifs, indiquant que le goodwill doit faire l'objet de tests de dépréciation sur une base annuelle. Dans le cadre des normes internationales d'information financière (IFRS), l'étude présente vise à étudier la façon dont la dépréciation du goodwill est entraînée par la performance relative de l'entreprise en Europe, en utilisant des données d'Allemagne. Plus précisément, le document met l'accent sur deux analyses distinctes: comparer les différences entre les entreprises avec ou sans dépréciation (analyse transversale) et comparer les années successives avec ou sans dépréciation pour chaque entreprise (analyse longitudinale). En utilisant les tests statistiques t et Wilcoxon Rank Sum, les résultats confirment partiellement l'hypothèse que les entreprises avec dépréciation sont beaucoup moins efficaces lorsque l'on compare à des entreprises sans dépréciation dans la période de reconnaissance de dépréciation du goodwill. Cependant, les résultats de l'analyse longitudinale ne supportent pas l'hypothèse selon laquelle les entreprises d'Allemagne sont relativement moins efficaces dans l'année de l'écart d'acquisition en comparant à l'année sans perte de valeur. Ces résultats sont en ligne avec les études similaires appliquées aux États-Unis et aux principes comptables généralement acceptés aux États-Unis (US GAAP). Tenant, en compte les conclusions de l'analyse longitudinale, le sujet de la manipulation des résultats est brièvement discuté.

Mots clés: Normes internationales d'information financière (IFRS); goodwill; dépréciation du goodwill; performance relative de l'entreprise; manipulation des chiffres; Allemagne.

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* This Table is divided in three Sub-Tables for each type of firm performance measure: Operating Cash Flow (Sub-Table 1); Earnings Before Taxes Excluding Unusual Items (Sub-Table 2); and Weighted Average of Operating Cash Flow and Earnings Before Taxes Excluding Unusual Items (Sub-Table 3).

CHAPTER 1

INTRODUCTION

The International Financial Reporting Standards 3 – *Business Combinations* (IFRS 3, 2008) defines goodwill as “an asset representing the future economic benefits arising from assets that are not capable of being individually identified and separately recognized”, being therefore obtained as the excess of the cost of an acquired entity over the fair value of its identifiable assets and liabilities.

Over time, goodwill has faced significant changes in terms of regulation (Ding et al., 2008). More recently, regulation tends to go in contradiction of goodwill amortization, by suggesting goodwill impairment tests in order to analyze the difference between the fair value of the reporting unit goodwill and the carrying amount of the correspondent goodwill.

In June 2001, the Financial Accounting Standards Board (FASB) firstly introduced this new concept, through the Statement of Financial Accounting Standards 141 – *Business Combinations* (SFAS 141, 2001) and the Statement of Financial Accounting Standards 142 – *Goodwill and Other Intangible Assets* (SFAS 142, 2001), under the framework of United States Generally Accepted Accounting Principles (US GAAP). Later in 2004, the International Accounting Standards Board (IASB) issued IFRS 3 (2004), under International Financial Reporting Standards (IFRS). In the same year, a revision occurred on the International Accounting Standards (IAS) through the International Accounting Standards 36 – *Impairment of Assets* (IAS 36, 2004) and the International Accounting Standards 38 – *Intangible Assets* (IAS 38, 2004). With the aim of moving towards international convergence, four years later, the FASB and the IASB revised SFAS 141 (2004) and IFRS 3 (2004), respectively, which resulted in SFAS 141 (2008) and IFRS 3 (2008).

The new accounting standards related to goodwill treatment, and particularly the replacement of systematic goodwill amortization by annual goodwill impairment tests, beget the question of subjectivity of the tests in evaluating goodwill impairment to recognize periodically. For instance, Churyk (2005) studied the appropriateness of the new standard issued in 2001 by testing market valuations of goodwill, finding weak evidence for the initial impairment of goodwill. Additionally, Devalle & Rizzato (2012) developed a study on the quality of the mandatory disclosure of IAS 36 (2004), with a particular focus on goodwill impairment disclosure, suggesting a low disclosure index and large discrepancies between the stock markets analyzed.

More specifically, in the context of the new rules introduced by SFAS 142 (2001), Vichitsarawong (2007) studied the usefulness of goodwill impairment by assessing the relative efficiency of companies, in the reality of the United States. Using a cross-sectional (comparison between firms) and a longitudinal analysis (comparison over time), the conclusions partially support the idea that goodwill impairment reflects the decrease in the relative firm efficiency. Consequently, the implementation of SFAS 142 (2001) contributes to the fulfillment of the FASB's objective.

According to Swanson et al. (2013), although the main principles are similar, slight differences between the US GAAP and the IFRS approaches might suggest that it is easier for American companies using US GAAP to avoid incurring an impairment loss than for companies following IFRS principles. Therefore, results obtained when testing this possible relationship might end up being different with IFRS treatment, allowing the obtention of distinct conclusions. Moreover, periods of economic adversity are considered to be important moments for accounting regulation (Bertomeu & Magee, 2011). As a result, the incorporation of financial crisis years within the period of analysis may have an impact on results.

In this context, this dissertation aims at studying the same relationship developed by Vichitsarawong (2007), although concentrated on the European reality, taking the particular case of Germany, and considering a different and longer period of analysis. In fact, Germany is considered to be the largest economy in Europe, presenting the highest GDP over the past several years (Piirto, 2012). As a consequence of increasing integration in Europe, Germany's commercial and accounting policies tend to be influenced by European Union regulation. Moreover, German culture plays an important role in the quality of accounting and reporting, since Germans reveal a tendency to be more conservative in the interpretation of probability expressions in the context of the IFRS (Douppnik & Richter, 2003).

Based on this, the present study attempts to give an answer to the following research question:

“How is goodwill impairment driven by relative firm performance?

- Evidence from Germany”

Using different measures of firm performance for sensitivity analysis purposes, the hypotheses deriving from this research question are tested at two distinct dimensions. Firstly, a cross-sectional analysis intends to compare firms presenting goodwill impairments during

the period of analysis with others in the same industry but with no goodwill impairment recognition. Secondly, a longitudinal analysis aims to analyze the same relationship over time, individually for each firm.

The present paper contributes to current literature by applying the research study developed by Vichitsarawong (2007) to an European environment and to a subsequent and more extended period of time. Moreover, it discusses further managerial implications related to the topic, taking into consideration the findings from the statistical tests.

Besides, this analysis is particularly relevant for auditors, investors and other financial statement users since it helps to understand the usefulness of current accounting standards regarding goodwill recognition and impairment.

The remainder of this study is organized as follows. Chapter 2 presents the relevant accounting regulation on the topic. Chapter 3 reviews the related former literature. Chapter 4 is focused on the research question's definition and develops the hypotheses. Chapter 5 contains the empirical study design, findings and managerial implications. Chapter 6 concludes the paper.

CHAPTER 2

ACCOUNTING REGULATION

This research study is focused on the goodwill impairment thematic in the context of the new accounting standards. For this purpose, a brief presentation of related accounting regulation is required. On the one hand, in the context of US-GAAP, the most important regulation about the topic is defined in SFAS 142 (2001). On the other hand, in the context of IFRS, IFRS 3 (2004; 2008) and IAS 36 (2004) are of extreme relevance.

2.1 SFAS 142 under US-GAAP

SFAS 142 (2001) refers to the financial accounting and reporting of acquired goodwill and other intangible assets, superseding the Accounting Principles Board Opinion 17 - *Intangible Assets* (APB Opinion 17, 1970). According to this standard, the need for the issue of the new statement arose partly in response to financial statements users' opinion, arguing the usefulness of goodwill amortization in analyzing investments. Changes introduced by the statement intend to improve financial reporting by offering a better understanding of the underlying economic value of goodwill and consequently allowing users to better evaluate companies' future profitability and cash flows (SFAS 142, 2001, Summary).

Paragraph 19 of SFAS 142 (2001) states that goodwill shall not be amortized, but instead tested for impairment. The impairment exists when the value of the carrying amount of goodwill is higher than the implied fair value. According to this standard, goodwill should be tested by managers at the reporting unit level. A reporting unit level is defined in paragraph 10 of the Statement of Financial Accounting Standards 131 – *Disclosures about Segments of an Enterprise and Related Information* (SFAS 131, 1997) as an operating segment or one level below an operating segment. A two-step impairment test must be followed.

1. The first step of the goodwill impairment test is concentrated on identifying potential impairment. For that, a comparison between the carrying amount and the fair value of a reporting unit¹ (including goodwill) should be made. If the fair value of a reporting unit is higher than its carrying amount, no impairment should be recognized. However, if the carrying amount of a reporting amount is higher than its fair value, one should proceed to the second step in order to measure the amount of impairment of goodwill to recognize.

2. The second step of the impairment test is focused on evaluating the value of goodwill impairment to recognize. In this case, the implied fair value of reporting unit goodwill² and the carrying amount of that goodwill should be compared. If the carrying amount of reporting unit goodwill is higher than the implied fair value of that goodwill, the amount of the excess should be recognized as an impairment loss. From that time, the new accounting basis of the goodwill will be the adjusted carrying amount of the goodwill.

In general, impairment tests should be made annually. Nevertheless, under certain circumstances, additional impairments might be necessary, as the example of considerable legal adverse changes; adverse changes in the business environment; adverse actions by regulators; unexpected competition; and others.

Under these norms, one should notice that, not only management estimates and assumptions in impairment testing are subjective, but also information concerning each reporting unit is frequently difficult to obtain (Vichitsarawong, 2007).

Furthermore, during the process of determining goodwill impairments, managers make use of present value techniques to measure the fair value of a reporting unit. However, future cash flows estimate is based on past and present performance, evidencing the relevance of firm performance in assessing a goodwill impairment loss (Vichitsarawong, 2007).

¹ According to paragraph 23 of SFAS 142 (2001), “the fair value of an asset (or liability) is the amount at which that asset (or liability) could be bought (or incurred) or sold (or settled) in a current transaction between willing parties...” “If quoted market prices are not available, the estimate of fair value shall be based on the best information available, including prices for similar assets and liabilities and the results of using other valuation techniques.”

² In accordance with paragraph 21 of SFAS no. 142, “the implied fair value of goodwill should be determined in the same manner as the amount of goodwill recognized in a business combination is determined.” “The excess of the fair value of a reporting unit over the amounts assigned to its assets and liabilities is the implied fair value of goodwill”.

2.2 IFRS 3 and IAS 36 under IFRS

Issued by the IASB, IFRS 3 (2008) was developed with the aim of improving the “relevance, reliability and comparability of the information” delivered by a reporting entity in its financial reporting concerning “business combinations and its effects” (IFRS 3, 2008, Objective).

IAS 36 (2004) develops the subject of impairment of assets, stating that goodwill should be subject to impairment tests on an annual basis or more frequently in certain circumstances. The standard demands acquired goodwill in a business combination to be tested for impairment in the context of the impairment testing the cash-generating unit(s) is associated with. The cash-generating units to which goodwill is allocated should present the lowest level of entity to which goodwill is assigned. Furthermore, the unit or group of units to which the goodwill is allocated should not be larger than an operating segment. Under IAS 36 (2004), the recognition of impairment occurs when the carrying value of the cash-generating units is higher than the greater value of its value in use and its net realizable value (i.e., its recoverable amount).

Although one of the main purposes of the changes in IFRS 3 (2004) was related to the convergence intention with US GAAP, some differences still remain between the two accounting treatments, according to Jerman & Manzin (2008).

Firstly, concerning the cash-generating units (or reporting units), SFAS 142 (2001) do not allow a reporting unit to be identified at a lower level than an operating segment, while IAS 36 (2004) does not establish such constraint. Consequently, under IFRS the impairment test may be done at a lower level when comparing to US GAAP.

Secondly, there is a significant difference regarding the impairment testing of goodwill. The approach followed by IAS 36 (2004) does not suggest a two-step method, meaning that the impairment loss should be calculated at the moment of the conclusion of step number one.

These differences might suggest that is easier for American companies using US GAAP to avoid incurring an impairment loss than for companies following IFRS principles (Swanson et al., 2013). According to the authors, this may happen because reporting units may be softened and restructured in a way that fair market values of the reorganized units do not present losses at an individual level. Also, cash-generating units require assets or groups of assets to be linked to certain cash flows, which have no relation to the other cash flows of the company. Hence, it would be more unlikely to avoid impairment losses recognition when there is an indication of the deterioration of the specific assets.

CHAPTER 3

LITERATURE REVIEW

3.1 Goodwill impairment

After presenting the accounting regulation associated with the topic, it is important to explain the background of goodwill treatment over time. Given the recent modifications introduced by new accounting standards, prior literature on the value relevance of goodwill impairment is examined.

3.1.1 Goodwill treatment over time

IFRS 3 (2008) defines goodwill as “an asset representing the future economic benefits arising from assets that are not capable of being individually identified and separately recognized”, being therefore obtained as the excess of the cost of an acquired entity over the fair value of its identifiable assets and liabilities. The value of goodwill is created from the value of combining entities, being related to improvements of management efficiency (Lang et al., 1989), synergies gains resulting from economies of scale (Bradley et al., 1988) and benefits from internal financial advantages in comparison to external financing (Nielsen & Melicher, 1973). Also, goodwill may result from the integration of processes, enhancement of production techniques (Vichitsarawong, 2007). Therefore, goodwill represents an important portion of a firm’s value. For instance, during the period from 1990 to 1994, it represented approximately 20 percent of the overall assets of business combinations (Henning et al., 2004).

Over time, goodwill has faced significant changes in terms of regulation. Ding et al. (2008) considers four main phases in the evolution of goodwill treatment, in the period between 1985 and 2005 and focusing the analysis on four Western capitalist countries: Germany, Great Britain, United States and France.

The first phase is mentioned as the static phase (non-recognition phase), arguing that goodwill is considered a true asset and therefore it should be expensed, instantaneously or within a short period of time. The second stage is referred to as the weakened static phase, in which goodwill is charged as equity, combining two distinct arguments: firstly, goodwill is not an asset; secondly, it should give the opportunity of dividend distribution from the current profit.

Phase number three is the dynamic phase, claiming that acquired goodwill should be systematically amortized in a way that reduces current income. Particularly, APB Opinion 17 (1970) required for goodwill to be amortized over a period that could not exceed 40 years, while the previous International Accounting Standards 22 – *Business Combinations* (IAS 22, 1998) imposed a linear amortization that could not exceed 20 years (Jerman & Manzin, 2008). Finally, the fourth phase is named as the actuarial phase and goes against goodwill amortization, by suggesting goodwill impairment tests in order to analyze the difference between the fair value of goodwill and the carrying amount of the correspondent goodwill.

In 2001, the FASB firstly introduced this new concept, through SFAS 141 (2001) and SFAS 142 (2001), under the framework of US GAAP. Later in 2004, the IASB issued IFRS 3 (2004), under IFRS. In the same year, a revision occurred on the IAS through IAS 36 (2004) and IAS 38 (2004). With the aim of moving towards international convergence, four years later, the FASB and the IASB revised SFAS 141 (2004) and IFRS 3 (2004), respectively, which resulted in SFAS 141 (2008) and IFRS 3 (2008).

Considering the particular case of Germany, Ding et al. (2008) mentions the first phase has been deemed to occur between 1880 and 1985; the second one from 1985 to 2000; the third one between 2000 and 2005 and finally the current stage from 2005 onwards. This year corresponds to the period in which preparation of consolidated financial statements under IFRS became mandatory for European Union listed companies.

3.1.2 Value relevance of goodwill impairment

The elimination of systematic goodwill amortization, giving place to annual goodwill impairment tests, brings the question of the value relevance of goodwill impairment, as a result of the uncertainty and subjectivity of the tests in evaluating goodwill impairment to be recognized periodically.

Churyk (2005) studied the appropriateness of the new standard issued in 2001 by testing market valuations of goodwill, finding weak evidence for the initial impairment of goodwill, but strong support for the following impairments.

Devalle & Rizzato (2012) develops a study on the quality of the mandatory disclosure of IAS 36 (2004), with a particular focus on goodwill impairment disclosure. The results suggest a low disclosure index and large discrepancies between the stock markets analyzed.

In another empirical study, Xu et al. (2011) analyzes the value relevance and reliability of reported goodwill impairment and concludes that, while typically regarded as relevant information, the signal delivered depends on the profitability of the firm. Thus, regarding goodwill impairment recognition, in the case of profitable firms there is a negative connotation developed by investors, while for unprofitable companies this negative signal does not exist. In this context, it seems to be advantageous to evaluate and disclose goodwill impairment on an annual basis.

Some studies have suggested that decisions regarding goodwill might be affected by specific external variables. For instance, Detzen & Zülch (2012) explores the relationship between CEO's short-term cash bonuses and the amount of goodwill recognized in IFRS acquisitions. The findings indicate that increasing cash bonus for managers have a positive impact on the amount of goodwill recognized.

Also, and specifically in line with subject of this study, the decision regarding impairment of goodwill may be affected by certain factors. Masters-Stout et al. (2008) studied the tenure of the chief executive officer and the his/her goodwill impairment decisions, concluding that managers in charge will tend to recognize a greater amount of goodwill impairment in the first years with two possible aims: first, blaming previous managers on decisions regarding acquisitions; secondly, increasing future earnings by expensing goodwill at a earlier stage.

Finally, Guler (2007) finds out that managers' reporting incentives affect their decision to recognize impairments of goodwill. In addition, there seems to exist a relationship between the recognition of goodwill impairment losses and the strength of the firm's corporate governance.

3.2 Firm performance

Firm performance, and particularly firm performance measurement, is a subjective topic and therefore may be evaluated considering distinct variables and dimensions. In fact, this topic has been a concern in strategic management research for many years (Zimmerman, 2001; Chakravarthy & Jones, 1986).

Some authors argue that the main concern related to firm performance is a gap between the "specification of the firm performance construct and the way performance is measured in empirical research study" (Glick et al., 2013). As a result, it may be complicated to establish a

comparison between the findings of researches that are based on the same theoretical concepts, although using distinct performance measures (Steigenberger, 2014). Some variables may be better than others and as a result the merits and demerits of particular measures and types of measures of firm performance have been examined over the years (Dalton & Aguinis, 2013; Richard et al., 2009).

According to Lau (2011), performance measures may be classified as financial and nonfinancial. Particularly in what concerns to financial measures, these are the type of measures, as the example of cash flows and profits, that may be aggregated and compared across firms (Meyer, 2002).

It is certainly useful providing a brief compilation of financial measures used in previous studies. Firstly, Francis et al. (1996) relies on changes in return on assets to control for firm performance, defining return on assets as the ratio of income before extraordinary items to average total assets. Secondly, the percent change in sales for firms from prior year may be a way of measuring firm performance (Riedl, 2004). Thirdly, Pășcan & Țurcaș (2012) measures the impact of first-time adoption of IFRS on the performance of Romanian groups of listed companies, being performance expressed by means of net income. Lastly, Park & Jang (2013) studies the relationship between capital structure, free cash flow, diversification and firm performance, measuring the latter using *Tobin's q*, a measure of firm assets in comparison to the firm's market value.

More specifically, Delen et al. (2013) explores the evaluation of performance using financial ratios. The authors argue their advantage in terms of establishing comparisons across companies in the same industry, between industries, or even within an enterprise itself. These tools also allow for the comparison of relative performance for companies of different size. An empirical study led to the conclusion that firm performance, represented as return on equity or return on assets, is mainly impacted by three types of ratios. Firstly, the profitability ratios are considered, more specifically earnings before tax-to-equity ratio and net profit margin. Secondly, leverage and debt ratios were found to have an impact on performance. Lastly, the importance of sales growth and asset turnover rate as measures of the company's ability to generate sales and consequently impact the overall performance was highlighted.

From a different point of view, Coelli (2005) considers efficiency as a possible measure of performance. Considering inputs used by a firm and outputs obtained by the same, the author defines efficiency as a ratio of the significant outputs to the considerable inputs. Also Neely et al. (1995) defines a performance measure as a "metric used to quantify the efficiency and/or

effectiveness of action”. Based on this, Vichitsarawong (2007) uses efficiency as a measure of financial performance, considering cost of goods sold; selling, general and administrative expenses; current assets; fixed assets; and intangible assets as inputs and sales; income before extraordinary items; and operating cash flows as outputs. For the author, performance is a relative concept (relative efficiency), being always evaluated in comparison to the performance of another company or to the performance of the same company but relative to a different period of time.

3.3 Goodwill impairment and relative firm performance

In theory, goodwill represents the present value of a combination of expected future cash flows and for that reason it is recorded as an asset (Jennings & Robinson, 1996). Nonetheless, cash flows associated with goodwill will be mixed with those related to other assets owned by the company. As a consequence, goodwill impairment is expected to indicate a signal of relevant changes in the value of goodwill and expected company’s future earnings (Hirschey & Richardson, 2002).

Having this in mind, and in the context of the new rules introduced by SFAS 142 (2001), Vichitsarawong (2007) studied the usefulness of goodwill impairment by assessing the relative efficiency of companies, in the reality of the United States. Using a cross-sectional (comparison between firms) and a longitudinal analysis (comparison over time), the conclusions showed that goodwill impairment reflects the decrease in the relative firm efficiency and consequently the implementation of SFAS 142 (2001) allows the achievement of the FASB’s objective. Additionally, the author studies the role of the relative efficiency of firms in the decision to recognize goodwill impairment charges, as well as in the definition of the quantity of goodwill impairment, for the reality of the United States. The results confirm that relative efficiency is an important determinant of goodwill impairment.

3.4 The German reality

Germany is considered the largest economy in Europe, presenting the highest GDP in the past several years (Piiro, 2012). It is seen as a stakeholder economy, although with a less-developed stock market, lack protection for investor and concentrated ownership (La Porta et

al., 1998; Leuz & Wüstemann, 2003). German accounting standards are the Germany Generally Accepted Accounting Principles (German GAAP) follow the HGB, the commercial code in Germany, in which financial reporting and auditing regulations are dependent on the legal form (Brown et al., 2013).

As a consequence of increasing integration in Europe, Germany's commercial and accounting policies tend to be influenced by European Union regulation. Also the German culture plays an important role in the quality of accounting and reporting, since Germans reveal a tendency to be more conservative in the interpretation of probability expressions in the context of the IFRS (Doupnik & Richter, 2003).

However, IFRS is less important in Germany when comparing to other countries, as the example of United Kingdom. This happens because, although IFRS have been focused on investors' interests and needs, a great number of German firms are privately owned and only capital market companies are obliged to apply IFRS for their consolidated financial statements (Hellmann et al., 2010). In fact, the accounting policies for individual financial statements of the companies mostly follow the HGB. In accordance to Hellmann et al. (2010), there have been some inconsistencies in the application of IFRS, which may be related to several causes: the fact that financial statements in Germany might be prepared by accountants who may not be associated with a professional entity; translation of IFRS into German; interpretation of IFRS by Germans; lack of quality accountants, education and training; and lobbying activities.

CHAPTER 4

RESEARCH QUESTION AND HYPOTHESES DEVELOPMENT

4.1 Research question

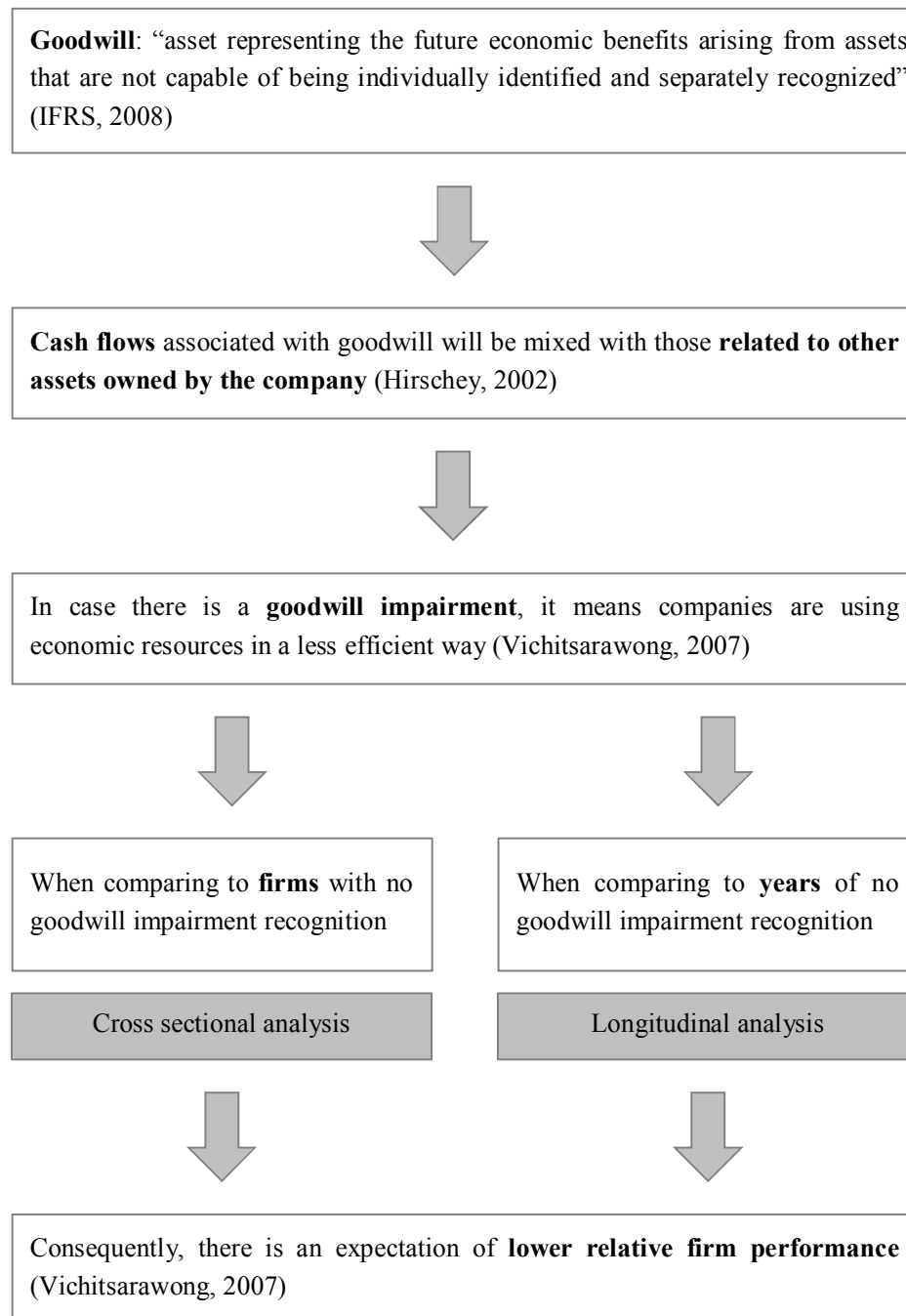
A previous study developed by Vichitsarawong (2007) attempted to establish a relationship between goodwill impairment and relative efficiency of firms in order to determine the usefulness of goodwill impairment under SFAS 142 (2001). Similarly, this research intends to study the relationship between goodwill impairment and firm performance, although using a distinct environment and considering a subsequent and more extended period of analysis.

Therefore, instead of focusing the analysis on the United States market following US-GAAP, this research will be concentrated on the European reality under IFRS, taking the particular case of Germany. According to Swanson et al. (2013), although the main principles are similar, slight differences in the US GAAP and IFRS approaches might suggest that is easier for American companies using US GAAP to avoid incurring an impairment loss than for companies following IFRS principles. Hence, the results obtained when testing this possible relationship might end up being different with IFRS treatment, allowing therefore to obtain distinct conclusions.

Despite the fact that IFRS is less important in Germany when comparing to other European countries (Hellmann et al., 2010), this country is considered the largest economy in Europe (Piirto, 2012) and consequently an adequate representation of the European reality. Also, only companies of this country are chosen in order to obtain stable environments.

In addition, periods of economic adversity are considered to be important moments for accounting regulation (Bertomeu & Magee, 2011). Kousenidis et al. (2013), basing their analysis in the countries more affected with the financial crisis, suggests that, although earnings quality has improved in the crisis period, there is still a deterioration of reporting quality if there are incentives for earnings management. This way, the incorporation of financial crisis years on the period of analysis may have an impact on the results obtained.

Having all the previous ideas into consideration, this research is focused on the topic of the goodwill impairment in the context of the new accounting standards and attempts to give an answer to the following research question: “How is goodwill impairment driven by relative firm performance? – Evidence from Germany”. The theoretical approach is presented in Figure 1.

Figure 1 - Theoretical model

4.2 Hypotheses development

In order to give response to the research question, two distinct analyses are developed, based on five hypotheses that are presented below.

4.2.1 Cross-sectional analysis

Since cash flows associated with goodwill will be mixed with those related to other assets owned by the company, goodwill impairment is expected to indicate a signal of relevant changes in the value of goodwill and expected company's future earnings (Hirschey & Richardson, 2002).

Like Vichitsarawong (2007), this study will begin to develop a cross-sectional analysis, based on the hypothesis that impairment firms tend to use their economic resources in a less efficient way when comparing to non-impairment companies. As a consequence, impairment firms are expected to present lower performance, lower profitability and lower net cash flows. Based on this reasoning, the first alternative hypothesis uses both impairment and non-impairment firm samples and is defined below:

HA: Impairment firms present relative low performance than non-impairment firms in the year of goodwill impairment recognition.

4.2.1 Longitudinal analysis

Also similarly to Vichitsarawong (2007) the longitudinal analysis aims at studying changes in the relative firm performance of impairment and non-impairment firms over time. Based on the reasoning that firms are more likely to present lower firm performance in the years of goodwill impairment recognition, four scenarios are considered.

The first hypothesis is focused on the study of the relationship of goodwill impairment and relative firm performance for the case of companies that, in two consecutive years, present impairment losses on both years. In this event, it is expected a decrease in firm performance from one year to the other. The definition of the alternative hypothesis is therefore defined as follows:

HB: If impairment firms report goodwill impairment in two consecutive years, firm performance is higher in the first year (of impairment reporting) comparing to the second year (of impairment reporting).

The second case aims to cover the situations in which a firm recognizes goodwill impairment in a first year, although in the second year there is no recognition related to this subject. Once again, it is expected that in the year of goodwill impairment recognition the performance is lower. The alternative hypothesis is therefore the following:

HC: In two consecutive years, if firms report goodwill impairment in the first year but not in the second year, firm performance is lower in the first year (of impairment reporting) comparing to the second year (of no impairment reporting).

On the contrary, it might occur the inverse case, assuming no impairment in the first year of analysis, but impairment recognition in the following year. Applying the same reasoning, the alternative hypothesis should be defined as follows:

HD: In two consecutive years, if firms report goodwill impairment in the second year without having reported in the first year, firm performance is higher in the first year (of no impairment reporting) comparing to the first year (of impairment reporting).

Finally, the case that is lacking consideration is the one in which there are no impairment losses during two consecutive years. This situation may suggest that performance has increased from one year to the other, otherwise a goodwill impairment loss should have been recognized in the second year. This way, the last alternative to consider is presented below:

HE: If impairment firms do not report goodwill impairment in two consecutive years, firm performance is lower in the first year (of no impairment reporting) comparing to the second year (of no impairment reporting).

Figure 2 presents the summary of the overall hypotheses.

Figure 2 - Hypotheses development scheme

	Comparison between years		Comparison between firms		
	Firm <i>X</i> - Year <i>t</i>	Firm <i>Y</i> - Year <i>t</i>	Firm <i>X</i> - Year <i>t</i>	Firm <i>X</i> - Year <i>t+1</i>	
Impairment	X				<i>H_A</i>
No impairment	X				
Impairment			X	X	<i>H_B</i>
No impairment					
Impairment			X		<i>H_C</i>
No Impairment				X	
Impairment				X	<i>H_D</i>
No impairment			X		
Impairment					<i>H_E</i>
No impairment			X	X	
	<i>For each year</i>		<i>For each impairment firm</i>		

CHAPTER 5

EMPIRICAL STUDY

5.1 Data and sample selection

The data and sample selection process starts with the compilation of the list of equity and/or debt publicly traded companies in Germany present in the Directory of Public Companies in Germany by the Credit Risk Monitor and belonging to three specific industries: durable manufacturing industry, technology industry and service industry.

The choice of the three industries is based on the relevance of mergers and acquisitions activity and the frequency of goodwill impairment losses recorded for each industry (Vichitsarawong, 2007). In fact, the same author provided 514 firm-year observations with goodwill impairment losses belonging to the top three industries, representing approximately 56 percent of the overall observations from the 14 industries considered (Table 1).

Table 1 - Industry distribution of impairment observations (2002-2005)

Industry	Total Firm-year Obs.	Impairment Firm-year Obs.	%
1. Mining and Construction	250	20	8,00%
2. Food	361	15	4,16%
3. Textiles and Printing & Publications	730	44	6,03%
4. Chemicals	369	29	7,86%
5. Pharmaceuticals	531	28	5,27%
6. Extractive Industries	336	14	4,17%
7. Durable Manufacturers	3332	210	6,30%
8. Computers	2418	180	7,44%
9. Transportation	952	82	8,61%
10. Utilities	205	15	7,32%
11. Retail	1550	65	4,19%
12. Financial Institutions	917	72	7,85%
13. Insurance and Real Estate	293	16	5,46%
14. Services	1713	124	7,24%
Total	13957	914	
Top three industries:			
Durable Manufacturers	3332	210	
Computers	2418	180	
Services	1713	124	
Total	7463	514	
Percentage of top three industries to all industries	53,47%	56,24%	

Source: Vichitsarawong (2007)

Based on this, the present study considers three industries. Firstly, durable manufacturer industry comprises chemical manufacturing; construction services; consumer cyclical; containers & packaging; fabricated plastic & rubber; miscellaneous capital goods; miscellaneous fabricated products; and non-metallic mining. Secondly, technology industry covers computer networks; computer peripherals; computer services; and extends further in the industry to communication services; communications equipment; electronic instruments and controls; semiconductors; and software & programming. Thirdly, service industry encompasses a wide variety of businesses: advertising; broadcasting & cable TV; business services; communications services; motion pictures; personal services; real estate operations; printing & publishing; restaurants; retailing, utilities; recreational activities; transportation; and hotels & motels.

Using *Capital IQ* as the source for data collection, an initial sample of 675 firms for the fiscal years from 2006 to 2011, presenting goodwill balances under IFRS, is obtained.

The next step requests an elimination of companies with no goodwill impairment during the period of analysis - 464 firms - and also companies presenting missing data (for instance, absence of information regarding one specific financial statement) – 123 firms. At this point, the final sample comprises a total number of 88 firms, composed of 33 durable manufacturing firms, 29 technology firms and 26 service firms. These are named impairment firms and consist of firms with goodwill impairment losses for at least one year during the period between 2006-2011.

All these firms are tested under the longitudinal analysis regarding the different hypotheses previously presented.

However, the cross-sectional analysis requires some adjustments concerning the size of the company, in order to eliminate the presence of outliers that may bias the analysis. In that sense, the cross-sectional samples should only include companies presenting an average of total assets (considering the six years of analysis) between one billion euros and 2000 billion euros. Consequently, the sample is reduced to a total amount of 63 firms (22 durable manufacturing firms, 27 technology firms and 14 service firms).

In addition, for the special purpose of the cross-sectional analysis, a control sample of firms is collected, using 63 firms (22 durable manufacturing firms, 27 technology firms and 14 service firms), which report goodwill on the balance sheet, but no goodwill impairment losses over the period of analysis. These are named non-impairment firms and are selected randomly

within the list of sample firms fulfilling the requirements. Once obtained, this is the sample whose firms' performance is to be compared to that of impairment firms.

The complete list of sample firms, containing both impairment and non-impairment firms, is presented on Exhibit 1 and the entire data and sample selection process is presented in Table 2.

Table 2 - Sample selection

Selection Procedure	Firm-year Observations
Available observations for Germany public companies with goodwill balances from IQ Capital database between 2006-2011 for durable manufacturer, technology and service industries	675
Observations deleted due to:	
- No goodwill impairment	464
- Missing data	123
Final sample	88
Longitudinal analysis:	
Impairment observations classified by industry:	
- Durable manufacturers	33
- Technology	29
- Services	26
Total sample	88
Adjustments for the cross-sectional analysis due to:	
- No match with size requirements (total assets between €1 billion and €2000 billion)	25
Cross-sectional analysis:	
Impairment observations classified by industry:	
- Durable manufacturers	22
- Technology	27
- Services	14
Total sample	63

Note: For the cross-sectional analysis, the final impairment sample is matched with firms that present no goodwill impairment during the period of analysis, named non-impairment firms, presenting similar size (in terms of total assets) and available data for the same period of time.

5.2 Variables for firm performance measurement

The previous Chapter 3.2.2 supports the idea that firm performance measurement is a subjective topic and therefore it may be evaluated considering distinct variables and dimensions.

Based on the approach followed by Delen et al. (2013), this study makes use of financial ratios to measure performance, taking into account the purpose of comparing companies in

the same industry and across industries. Similarly, such ratios are also suitable when comparing companies with significantly disparate sizes. In that sense, all initial variables are divided by total sales in order to normalize the results and isolate scale effects.

Furthermore, the argument from Steigenberger (2014), based on the idea that conclusions from a study may differ according to the performance measures used, further reinforces the importance of evaluating more than one variable in the statistical analysis.

While measuring relative efficiency, Vichitsarawong (2007) considers as output variables three distinct measures: sales, income before extraordinary items³ and operating cash flow. Similarly, this research follows a relative approach, by considering the percentile ranks of each observation in relation to the overall observations of the industry. In addition, with the objective of developing a sensitivity analysis to the firm performance measurement, three distinctive ratios are considered in this research:

- **Operating Cash Flow to Sales:** this is a standard item shown in the cash flow statement of each firm, and collected within the *Capital IQ* database. It is important to mention that this particular database uses the indirect method to calculate operating cash flow, adjusting net income from the income statement for the effects of non-cash transactions. Moreover, it provides the operating cash flow including interest expenses (which are assumed to be related to the operational activity). This is permitted under IFRS, according to the International Accounting Standards 7 – *Statement of Cash Flows* (IAS 7, 2007), paragraph 31, in the case that interest expenses are paid regularly and there is no discretion.
- **Earnings Before Taxes Excluding Unusual Items to Sales:** similarly, this is a standard item presented in the *Capital IQ* database, in the income statement of each company. In a simplified way, this can be interpreted as the amount of money earned by a firm, after the cost of goods sold, interest expenses and operating expenses have been deducted from gross sales. This also excludes unusual items, such as restructuring changes, gain/loss on sale of assets, asset write-down and, notably, impairments of goodwill. Logically, for the purpose of this dissertation, the effect of the last item should not be considered.
- **Equally Weighted Average of the two variables mentioned above** (Operating Cash Flow to Sales and Earnings Before Taxes Excluding Unusual Items to Sales): to improve the robustness of the results obtained, the third measure results from a combination of the two previous variables, with a weight of 50 percent each.

³ Income before non-recurring items under IFRS

Regarding these two specific variables, Miller et al. (1988) argues that many managers have preferred evaluation techniques relying on cash flows rather than the ones based on profits. The main reason is related to the fact that cash in and cash equivalents is what can be actually spent or invested, and not the accounting figures such as profits based on an accrual assessment. Following this reasoning, cash flow is the most appropriate measure to pay attention to.

Finally, one should notice that both measures reflect the effect of capital structure, which may have an impact on the results obtained. However, as the performance of each firm is always measured relatively to the performance of the firms in the same industry, significant differences in terms of leverage decisions are not expected. As a matter of fact, Kayo & Kimura (2011) states that “firms working in the same industry present similar behavior regarding financial decisions, although such patterns differ across industries.”

5.3 Methodology

According to Wijnand & Velde (2000), there are different statistical tests that can be used in order to analyze if two samples come from the same distribution. The null hypothesis assumes that there is no systematic difference between two different samples and therefore they come from the same distribution. Conversely, the alternative hypothesis undertakes a systematic difference between the two samples. In case the test results in a considerably large probability that samples derive from the same distribution, the null hypothesis is not rejected. If, on the other side, the test leads to a small probability, the null hypothesis is rejected and the difference is consequently said to be statistically significant at a certain percentage level. The *p*-value indicates the probability that a test statistic is at least as extreme as the one computed, assuming that the null hypothesis is true (Goodman, 2008).

Assuming the distribution follows a normal distribution, it is common to use a parametric test, named two-sample *t*-test. However, in case the underlying distribution is not normal and specifically in the case of smaller samples, a non-parametric two-sample test, such as the Wilcoxon Rank Sum test, may be a suitable alternative (Wijnand & Velde, 2000).

In past literature there is not a consensus about which type of test is preferred over the other. For instance, Norman (2010) argues that parametric tests are appropriate for Likert data, small sample sized, unequal variances and non-normal distributions, with no risk of obtaining erroneous conclusions. Though, other authors argue that, in the absence of normality or

chance to induce normality in a suitable way, non-parametric tests may bring advantages such as higher relative efficiency.

Therefore, for the purpose of the hypotheses of this study, and considering that the sample sizes are relatively small, both type of tests are conducted – a *t*-test and a Wilcoxon Rank Sum test. In this context, it is possible to increase the robustness of the results obtained, by comparing findings and conclusions derived from both methodologies. All statistical tests are developed manually using *Excel* tools.

5.3.1 *t*-test

In order for a *t*-test to be considered valid, four requirements must be satisfied: independence of observations, inexistence of outliers, homogeneity of variances and normally distributed data (Osborne et al., 2012).

Regarding the independence of observations, each firm's observation is independent from the others' (in the cross-sectional analysis) and the firm's observation in one specific year is not related to the observation in the previous or following year (in the longitudinal analysis). In that sense, the same observations are not present in the two groups of analysis simultaneously. The inexistence of outliers could be more critical in the cross-sectional analysis, as in the longitudinal analysis the observations belong to the same firm. However, this condition is met with the size requirement for the cross-sectional sample (comprising only firms with a total average of assets between 1 billion euros and 2000 billion euros – see Table 2), which eliminates the presence of possible outliers.

In what concerns to the homogeneity of variances, there is no indication that the variance of the observations is significantly different from sample to sample, as the analysis is always performed taking into consideration the relative firm performance within the same industry.

Finally, the normality condition is assumed to be true through the use of percent ranks taking the industry as reference. Nonetheless, a sensitivity analysis is presented afterwards, through a non-parametric test.

Assuming the previous requirements are met, a *t*-test on the mean differences of relative firm performance of the samples is performed, for each of the hypotheses.

5.3.2 Wilcoxon Rank Sum test

For the Wilcoxon Rank Sum test to be valid, only two assumptions are required: that samples are random from their respective populations and that observations are independent from each other (Wijnand & Velde, 2000).

Despite the fact that impairment firm samples are mainly selected from the list of public companies in Germany subject to size requirements and information availability in the *IQ Capital* database, random samples may be assumed, as the sample used considerably represents the overall population of Germany firms presenting goodwill impairments under IFRS. Additionally, the list of non-impairments firms is randomly selected among the list of available firms in order to meet the number of impairment firms previously collected.

Concerning the independence of the samples, the justification presented in the *t*-test approach may be applied.

Using this methodology, the original elements are ranked by numbers. In this particular two-sample test, the procedure is to combine the two samples into a single and combined ordered sample, regardless of which population each observation belongs to and attributing rank numbers from the smallest to the largest value. The next step is to obtain the sum of the rank numbers of one sample. This essentially systematizes the intuition according to which a large rank sum may suggest that the values from that population are probably higher than the values belonging to the other population. Naturally, a small rank sum should lead to an opposite conclusion (Wijnand & Velde, 2000).

This statistical test is particularly useful for the longitudinal analysis, as sample sizes for each of the hypotheses are smaller, most of the times lower than ten.

5.4 Results and findings

Results and findings are presented separately for each type of analysis: Sub-Chapter 5.4.1 develops cross-sectional analysis and Sub-Chapter 5.4.2 is focused on the longitudinal analysis. The tables concerning each type of analysis are shown in the end of each Sub-Chapter.

5.4.1 Cross-sectional analysis

In order to study the first hypothesis, a sample of both impairment and non-impairment firms is considered.

Table 3 presents the sample distribution by industry. Due to companies' data availability, the number of companies for each industry is slightly different. Therefore, technology industry (Panel B) is the one presenting a higher number of companies, with 54 entities (both impairment and non-impairment firms) in each year, totaling 324 data points during the entire period. The second larger sample encompasses the durable manufacturer industry (Panel A), with a total of 264 data points during the six years, which represents 44 companies per year. Finally, services (Panel C) are the industry with the smaller sample size, since only 28 firms are analyzed each year, accounting for a total number of 168 data points over the six-year period.

Tables 4 to 7 summarize the results of the cross-sectional analysis, divided by type of statistical test and type of performance measure.

More specifically, Table 4 presents the *t*-test results used to analyze the difference of relative performance means for impairment and non-impairment firms, for different types of performance measures and evaluating each panel individually.

Using a left-tailed test, the null hypothesis assumes no difference in the companies' performances, while the alternative hypothesis assumes companies with goodwill impairment losses present a relative lower performance when comparing to non-impairment firms.

Table 4.1 shows the results assessing firm performance based on the Operating Cash Flow to Assets ratio. In general, all the industries present negative mean differences between impairment firms' relative performance and non-impairment firms' relative performance, across the entire period of analysis (with the exceptions of durable manufacturers in 2009 and 2010 and services in 2006). However, the only industry presenting statistically significant mean differences is the technology industry. Excluding the years of 2006 and 2010, the mean differences of relative firm performance are statistically different from zero in each year, at least at a 10% level. The most significant difference occurs in the year of 2008, with a *p*-value of 0,27%.

Table 4.2 considers a different measure of firm performance, Earnings Before Taxes Excluding Unusual Items to Assets ratio. In this case, the results show again negative mean differences in both durable manufacturer and technology industries, although this difference

tends to be positive in the case of the service industry (t -test is always above 6), going against the prediction. Once again, the only significant results are the ones related to the technology industry.

Finally, Table 4.3 uses an equally Weighted Average of the two measures presented above. Considering both measures simultaneously, the results strongly support the hypothesis for the technology industry, although there are no significant differences in the conclusions for the other two industries.

The differences of results in terms of industries may possibly be explained by the different sample sizes. In that sense, technology industry comprises the largest sample and therefore presents a greater amount of significant results. By contrast, service industry presents a few significant results and these are quite contrasting according to the type of performance measure used. As a matter of fact, this industry is not only the one presenting the smallest sample, as it also includes a wide variety of businesses with different particularities (the sample includes firms from advertising, communication, entertainment, retailing, and others). Taking this into consideration, less robust results may be expected from the service industry.

Table 5 shows the results of an aggregate analysis, by applying the same tests to a sample including the three industries' samples at the same time, resulting in a total of 126 firms in each year and, consequently, 756 data points over the entire period. In this case, there are significant results when performance is measured using the cash flow statement item, and also when using the weighted average measure. The significance of these results may probably arise from the larger sample size. Conversely, the income statement item measure is the less supportive of the hypothesis, given that results are never significant and the t -test mean difference is, in most cases, even positive.

With the aim of increasing the robustness of results, an alternative statistical test is developed - a non-parametric test named Wilcoxon Rank Sum test. However, one should mention that, for this particular analysis, as sample size is considerably large, this test does not represent so much value-added. Actually, whenever the sample size is larger than ten, an approximation to the normal distribution is made (Bellera & Julien, 2010) and a Wilcoxon Z-score is presented. Similarly to the parametric test, Table 6 presents the results discriminated by industry. It is possible to observe that results are quite similar, in terms of the differences between relative performances (i.e., whether positive or negative) and in what concerns to the significance of the results. In particular for the first measure (Operating Cash Flow to Sales), Table 6.1 shows significant mean differences for all years in the technology industry, with the exceptions of

2006 and 2010. For example, for the year of 2008, the null hypothesis is rejected at a significance level of 1% (p -value of 0,32%), presenting a Wilcoxon Z-score of -2,72. For 2007, 2009 and 2011, results are significant at a 5% level, showing Z-scores of -1,98, -1,70 and -2,12, respectively. Table 6.2 and Table 6.3 present the same statistics, although for the other measures considered, and results are quite comparable to the t -test findings.

The global results for the Wilcoxon Rank Sum test also support hypothesis A only for the cash flow statement measure, as shown in Table 7.

Overall, the results of the cross-sectional analysis show discrepancies between different types of performance measurement. Considering the argument presented by Miller et al. (1988), based on the idea that many managers have preferred evaluation techniques relying on cash flows rather than the ones based on profits, it is possible to partially validate hypothesis A, by revealing that impairment firms are significantly less efficient when comparing to non-impairment firms in the period of goodwill impairment recognition. In his study, and in a similar way, Vichitsarawong (2007) finds strong evidence that United States impairment firms are relatively less efficient than United States non-impairment firms in the year of goodwill impairment recognition.

Table 3 - Sample distribution by industry for cross-sectional analysis

Description	2006	2007	2008	2009	2010	2011	Total Firm-Year Obs.
Panel A: Durable Manufacturers							
Impairment firm in year t	22	22	22	22	22	22	132
Non-impairment firm in year t+1	22	22	22	22	22	22	132
Total	44	44	44	44	44	44	264
Panel B: Technology							
Impairment firm in year t	27	27	27	27	27	27	162
Non-impairment firm in year t+1	27	27	27	27	27	27	162
Total	54	54	54	54	54	54	324
Panel C: Services							
Impairment firm in year t	14	14	14	14	14	14	84
Non-impairment firm in year t+1	14	14	14	14	14	14	84
Total	28	28	28	28	28	28	168

Table 4 - Cross-sectional analysis by industry *t*-test**4.1 Firm performance measured with Operating Cash Flow to Sales****Panel A: Durable Manufacturers** (N per year=44)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	48,27%	51,64%	-0,37	n.m.
2007	48,16%	51,74%	-0,39	n.m.
2008	45,93%	53,97%	-0,89	18,93%
2009	55,02%	44,88%	1,13	n.m.
2010	51,01%	48,90%	0,23	n.m.
2011	48,36%	51,54%	-0,35	n.m.

Panel B: Technology (N per year=54)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	45,23%	54,67%	-1,17	12,33%
2007	41,95%	57,95%	-2,04*	2,34%
2008	38,94%	60,96%	-2,91***	0,27%
2009	43,07%	56,83%	-1,74**	4,43%
2010	47,33%	52,58%	-0,65	n.m.
2011	41,39%	58,51%	-2,19**	1,64%

Panel C: Services (N per year=28)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	52,59%	47,31%	0,45	n.m.
2007	44,94%	54,97%	-0,87	19,68%
2008	43,61%	56,30%	-1,11	13,93%
2009	41,76%	58,15%	-1,45*	7,92%
2010	43,61%	56,30%	-1,11	13,95%
2011	48,89%	51,01%	-0,18	n.m.

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level. Only *p*-values below 20% are indicated, being the others mentioned as n.m. (not meaningful).

4.2 Firm performance measured with Earnings Before Taxes Excluding Unusual Items to Sales

Panel A: Durable Manufacturers (N per year=44)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	48,15%	51,75%	-0,40	n.m.
2007	47,73%	52,17%	-0,49	n.m.
2008	45,09%	54,81%	-1,08	14,28%
2009	50,79%	49,11%	0,18	n.m.
2010	50,59%	49,32%	0,14	n.m.
2011	57,66%	42,24%	1,75	n.m.

Panel B: Technology (N per year=54)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	43,48%	56,42%	-1,63*	5,50%
2007	48,24%	51,67%	-0,42	n.m.
2008	45,65%	54,25%	-1,07	14,58%
2009	47,19%	52,71%	-0,68	n.m.
2010	44,04%	55,86%	-1,48*	7,26%
2011	41,11%	58,79%	-2,27**	1,37%

Panel C: Services (N per year=28)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	74,01%	25,90%	6,91	n.m.
2007	73,74%	26,16%	6,70	n.m.
2008	74,01%	25,90%	6,91	n.m.
2009	74,27%	25,64%	7,13	n.m.
2010	74,01%	25,90%	6,91	n.m.
2011	73,74%	26,16%	6,70	n.m.

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only *p*-values below 20% are indicated, being the others mentioned as n.m. (not meaningful).

4.3 Firm performance measured with Weighted Average

Panel A: Durable Manufacturers (N per year=44)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	48,21%	51,69%	-0,43	n.m.
2007	47,95%	51,96%	-0,47	n.m.
2008	45,51%	54,39%	-1,16	12,62%
2009	52,91%	47,00%	0,75	n.m.
2010	50,80%	49,11%	0,20	n.m.
2011	53,01%	46,89%	0,79	n.m.

Panel B: Technology (N per year= 54)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	44,36%	55,55%	-1,51*	6,92%
2007	45,09%	54,81%	-1,34*	9,34%
2008	42,30%	57,61%	-2,29**	1,30%
2009	45,13%	54,77%	-1,46*	7,54%
2010	45,68%	54,22%	-1,19	11,90%
2011	41,25%	58,65%	-2,48***	0,81%

Panel C: Services (N per year=28)

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	63,30%	36,61%	3,63	n.m.
2007	59,34%	40,57%	2,46	n.m.
2008	58,81%	41,10%	2,31	n.m.
2009	58,01%	41,89%	2,28	n.m.
2010	58,81%	41,10%	2,47	n.m.
2011	61,32%	38,59%	2,76	n.m.

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only *p*-values below 20% are indicated, being the others mentioned as n.m. (not meaningful).

Table 5 - Cross-sectional global analysis using *t*-test**5.1 Firm performance measured with Operating Cash Flow to Sales**

N per year=126

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	47,93%	51,98%	-0,76	n.m.
2007	44,78%	55,12%	-1,98**	2,51%
2008	42,42%	57,48%	-2,93***	0,20%
2009	46,95%	52,95%	-1,14	12,91%
2010	47,79%	52,12%	-0,82	n.m.
2011	45,49%	54,41%	-1,70**	4,59%

5.2 Firm performance measured with Earnings Before Taxes Excluding Unusual Items to Sales

N per year=126

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	51,90%	48,01%	0,73	n.m.
2007	53,73%	46,18%	1,43	n.m.
2008	51,76%	48,15%	0,68	n.m.
2009	54,47%	45,44%	1,72	n.m.
2010	52,99%	46,92%	1,15	n.m.
2011	54,14%	45,76%	1,60	n.m.

5.3 Firm performance measured with Weighted Average

N per year=126

Year	Mean Performance		<i>t</i> -test Mean Difference	<i>p</i> -value
	Impairment	Non-Impairment		
2006	49,91%	49,99%	-0,02	n.m.
2007	49,26%	50,65%	-0,30	n.m.
2008	47,09%	52,82%	-1,31*	9,57%
2009	50,71%	49,20%	0,35	n.m.
2010	50,39%	49,52%	0,19	n.m.
2011	49,82%	50,09%	-0,06	n.m.

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only *p*-values below 20% are indicated, being the others mentioned as n.m. (not meaningful).

Table 6 - Cross-sectional by industry using Wilcoxon Rank Sum test**6.1 Firm performance measured with Operating Cash Flow to Sales****Panel A: Durable Manufacturers** (N per year=44; Mean=495; St. Deviation=42,6)

Year	Mean Performance		Wilcoxon Z-Score	p-value
	Impairment	Non-Impairment		
2006	479	511	-0,38	n.m.
2007	478	512	-0,40	n.m.
2008	452,5	537,5	-1,00	15,92%
2009	545	445	1,17	n.m.
2010	505	485	0,23	n.m.
2011	491,5	498,5	-0,08	n.m.

Panel B: Technology (N per year=54; Mean=742,5; St. Deviation=57,8)

Year	Mean Performance		Wilcoxon Z-Score	p-value
	Impairment	Non-Impairment		
2006	625	810	-1,17	12,15%
2007	628	857	-1,98**	2,38%
2008	585	900	-2,72***	0,32%
2009	644	841	-1,70**	4,42%
2010	705	780	-0,65	n.m.
2011	620	865	-2,12**	1,70%

Panel C: Services (N per year=28; Mean=203; St. Deviation=21,8)

Year	Mean Performance		Wilcoxon Z-Score	p-value
	Impairment	Non-Impairment		
2006	213	193	0,46	n.m.
2007	184	222	-0,87	19,13%
2008	179	227	-1,10	13,51%
2009	172	234	-1,42*	7,72%
2010	179	227	-1,10	13,51%
2011	199	207	-0,18	n.m.

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only p-values below 20% are indicated, being the others mentioned as n.m. (not meaningful).

6.2 Firm performance measured with Earnings Before Taxes Excluding Unusual Items to Sales

Panel A: Durable Manufacturers (N per year=44; Mean=495; St. Deviation=42,6)

Year	Mean Performance		Wilcoxon Z-Score	<i>p</i> -value
	Impairment	Non-Impairment		
2006	478	512	-0,40	n.m.
2007	474	516	-0,49	n.m.
2008	450	540	-1,06	14,54%
2009	501	489	0,14	n.m.
2010	501	489	0,14	n.m.
2011	574	416	1,85	n.m.

Panel B: Technology (N per year=54; Mean=742,5; St. Deviation=57,8)

Year	Mean Performance		Wilcoxon Z-Score	<i>p</i> -value
	Impairment	Non-Impairment		
2006	650	835	-1,60*	5,48%
2007	718	767	-0,42	n.m.
2008	681	804	-1,06	14,37%
2009	703	782	-0,68	n.m.
2010	658	827	-1,46*	7,19%
2011	616	869	-2,19**	1,43%

Panel C: Services (N per year=28; Mean=203; St. Deviation=21,8)

Year	Mean Performance		Wilcoxon Z-Score	<i>p</i> -value
	Impairment	Non-Impairment		
2006	294	112	4,18	n.m.
2007	293	113	4,14	n.m.
2008	294	112	4,18	n.m.
2009	295	111	4,23	n.m.
2010	294	112	4,18	n.m.
2011	293	113	4,14	n.m.

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only *p*-values below 20% are indicated, being the others mentioned as n.m. (not meaningful).

6.3 Firm performance measured with Weighted Average

Panel A: Durable Manufacturers (N per year=44; Mean=495; St. Deviation=42,6)

Year	Mean Performance		Wilcoxon Z-Score	<i>p</i> -value
	Impairment	Non-Impairment		
2006	478,5	511,5	-0,39	n.m.
2007	473,5	516,5	-0,50	n.m.
2008	462	528	-0,77	n.m.
2009	535	455	0,94	n.m.
2010	505	485	0,23	n.m.
2011	538	452	1,01	n.m.

Panel B: Technology (N per year=54; Mean=742,5; St. Deviation=57,8)

Year	Mean Performance		Wilcoxon Z-Score	<i>p</i> -value
	Impairment	Non-Impairment		
2006	666,5	818,5	-1,31*	9,43%
2007	668	817	-1,29*	9,87%
2008	612	873	-2,26**	1,20%
2009	666,5	818,5	-1,31*	9,43%
2010	678	807	-1,12	13,22%
2011	606,5	878,5	-2,35***	0,93%

Panel C: Services (N per year=28; Mean=203; St. Deviation=21,8)

Year	Mean Performance		Wilcoxon Z-Score	<i>p</i> -value
	Impairment	Non-Impairment		
2006	272	134,5	3,15	n.m.
2007	247,5	158,5	2,04	n.m.
2008	247,5	158,5	2,04	n.m.
2009	242,5	163,5	1,81	n.m.
2010	248	158	2,07	n.m.
2011	251,5	154,5	2,23	n.m.

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only *p*-values below 20% are indicated, being the others mentioned as n.m. (not meaningful).

Table 7 - Cross-sectional global analysis using Wilcoxon Rank Sum test**7.1 Firm performance measured with Operating Cash Flow to Sales**

N per year=126; Mean=4000,5; St. Deviation=205

Year	Mean Performance		Wilcoxon Z-Score	p-value
	Impairment	Non-Impairment		
2006	3846,5	4154,5	-0,75	n.m.
2007	3600	4401	-1,95**	2,53%
2008	3415	4586	-2,86***	0,21%
2009	3768,5	4232,5	-1,13	12,88%
2010	3830	4171	-0,83	n.m.
2011	3657,5	4343,5	-1,67**	4,71%

7.2 Firm performance measured with Earnings Before Taxes Excluding Unusual Items to Sales

N per year=126; Mean=4000,5; St. Deviation=205

Year	Mean Performance		Wilcoxon Z-Score	p-value
	Impairment	Non-Impairment		
2006	4154	3847	0,75	n.m.
2007	4293	3708	1,43	n.m.
2008	4143,5	3857,5	0,70	n.m.
2009	4355,5	3645,5	1,73	n.m.
2010	4241	3760	1,17	n.m.
2011	4326	3675	1,59	n.m.

7.3 Firm performance measured with Weighted Average

N per year=126; Mean=4000,5; St. Deviation=205

Year	Mean Performance		Wilcoxon Z-Score	p-value
	Impairment	Non-Impairment		
2006	4033	3968	0,16	n.m.
2007	3948	4053	-0,26	n.m.
2008	3769,5	4231,5	-1,13	12,99%
2009	4140	3861	0,68	n.m.
2010	4067	3934	0,32	n.m.
2011	4000	4001	0,00	n.m.

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only p-values below 20% are indicated, being the others mentioned as n.m. (not meaningful).

5.4.2 Longitudinal analysis

For the longitudinal analysis, Table 8 presents the sample distribution by industry for each one of the hypotheses. The sample size differs from hypothesis to hypothesis, since it depends on the distribution of goodwill impairment write-offs across years and for each type of industry. Hence, the last hypothesis, focused on companies that do not report goodwill impairments during two consecutive years, is the one presenting the largest sample sizes. In terms of distribution by industry, durable manufacturers, technology and services sum up 159, 141 and 120 data points, respectively. In some cases, due to the reduced sample size, it is not possible to conduct any statistical test.

For the hypothesis B, named in the subsequent tables as “Impairment t, Impairment t+1”, a right-tailed test is conducted. The null hypothesis assumes no difference in both years’ performances, while the alternative hypothesis assumes the first year of impairment recognition will present a relative higher performance when comparing to the following year.

“Impairment t, Non-Impairment t+1” covers hypothesis C and is based on a left-tailed statistical test with an underlying alternative hypothesis which states that the first year of impairment recognition will present relative lower performance when compared to the subsequent year (of no impairment loss).

Conversely, hypothesis D is referenced as “Non-impairment t, Impairment t+1” and results from a right-tailed test with a higher relative firm performance for the first year, when no goodwill impairment was written-off, when compared to the following year, which encompasses impairment recognition.

Finally, “Non-Impairment t, Non-Impairment t+1” covers the last hypothesis (E) and is based on a left-tailed test, which assumes an alternative hypothesis under which firm performance is relatively lower in the first year when compared to the second year, and corresponds to a case of absence of goodwill impairment recognition in both years.

Table 9 shows the results for *t*-test on mean differences of firm performances for the different types of performance measurement. In general, there are no significant results for the four hypotheses, with a few exceptions. Table 9.1 presents significant values (at a 5% level) for the technology industry under hypothesis D in 2010-2011 and hypotheses B and E in 2009-2010. Table 9.2 shows only two significant values for the same industry under hypothesis C in 2007-2008 (*p*-value of 4,29%) and under hypothesis D in 2010-2011 (*p*-value of 5,61%).

Again for technology, Table 9.3 indicates only two significant values: under hypothesis E in 2009-2010 (p -value of 3,78%) and under hypothesis D in 2010-2011 (p -value of 2,97%).

For the global analysis, as shown in Table 10, t-tests do not support any of the four hypotheses.

The Wilcoxon Rank Sum test findings split by industry can be seen on Table 11. Due to small sample sizes, it is not possible to compute Wilcoxon Z-scores. The results are therefore obtained through the use of critical values from the Wilcoxon Rank Sum Table of Distributions and Critical Values. Table 11.1, as well as Table 11.3, displays a few significant results for the technology and service industries. Nevertheless, Table 11.2 only supports technology under hypothesis D and for the period 2010-2011.

Once again, the findings derived through the global analysis do not support the prediction across the years. The only significant value happens under hypothesis C and for the period of 2009-2010 (p -value of 6,27%), if using the first type of firm performance measure (Table 12).

Overall, the results of the longitudinal analysis do not support the hypothesis that Germany firms are relatively less efficient in the year of goodwill impairment comparing to the year of no impairment. In his study based on United States companies, Vichitsarawong (2007) only partially supports the longitudinal hypotheses.

Table 8 - Sample distribution by industry for longitudinal analysis

Description	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011		Total	
	2006	2007	2007	2008	2008	2009	2009	2010	2010	2011	Year t	Year t+1
Panel A: Durable Manufacturers												
1. Impairment t, Impairment t+1	4	4	3	3	4	4	3	3	2	2	16	16
2. Impairment t, Non-Impairment t+1	7	7	4	4	4	4	7	7	7	7	29	29
3. Non-Impairment t, Impairment t+1	2	2	6	6	3	3	6	6	10	10	27	27
4. Non-Impairment t, Non-Impairment t+1	18	18	19	19	19	19	17	17	14	14	87	87
Total impairment sample	31	31	32	32	30	30	33	33	32	32	159	159
Panel B: Technology												
1. Impairment t, Impairment t+1	1	1	2	2	4	4	3	3	2	2	12	12
2. Impairment t, Non-Impairment t+1	7	7	2	2	8	8	5	5	7	7	29	29
3. Non-Impairment t, Impairment t+1	3	3	10	10	5	5	5	5	4	4	27	27
4. Non-Impairment t, Non-Impairment t+1	17	17	15	15	12	12	14	14	15	15	73	73
Total impairment sample	28	28	29	29	29	29	27	27	28	28	141	141
Panel C: Services												
1. Impairment t, Impairment t+1	5	5	7	7	6	6	4	4	5	5	27	27
2. Impairment t, Non-Impairment t+1	4	4	1	1	10	10	7	7	2	2	24	24
3. Non-Impairment t, Impairment t+1	4	4	10	10	3	3	1	1	4	4	22	22
4. Non-Impairment t, Non-Impairment t+1	12	12	5	5	4	4	12	12	14	14	47	47
Total impairment sample	25	25	23	23	23	23	24	24	25	25	120	120

Table 9 - Longitudinal analysis by industry using *t*-test

9.1 Firm performance measured with Operating Cash Flow to Sales

	2006 vs. 2007			2007 vs. 2008			2008 vs. 2009			2009 vs. 2010			2010 vs. 2011		
	2006	2007	<i>t</i>	2007	2008	<i>t</i>	2008	2009	<i>t</i>	2009	2010	<i>t</i>	2010	2011	<i>t</i>
Panel A: Durable Manufacturers															
Impairment <i>t</i> , Impairment <i>t</i> +1	51,10%	44,98%	0,24	71,77%	75,33%	-0,90	54,98%	73,80%	0,55	42,00%	73,30%	0,42	42,30%	49,20%	0,42
Impairment <i>t</i> , Non-Impairment <i>t</i> +1	48,76%	50,06%	-0,08	28,05%	38,43%	-0,33	53,78%	29,20%	0,29	71,39%	49,37%	0,49	46,33%	43,57%	0,44
Non-Impairment <i>t</i> , Impairment <i>t</i> +1	86,10%	83,05%	0,15	56,12%	46,37%	0,68	32,23%	62,53%	0,32	22,27%	31,50%	0,22	43,50%	43,81%	0,44
Non-Impairment <i>t</i> , Non-Impairment <i>t</i> +1	46,36%	46,01%	0,04	44,31%	43,99%	0,04	47,73%	46,59%	0,47	51,09%	50,92%	0,51	55,44%	44,45%	0,44
Panel B: Technology															
Impairment <i>t</i> , Impairment <i>t</i> +1	-	-	-	49,10%	38,55%	0,18	32,88%	49,08%	-0,99	56,10%	29,20%	1,81*	41,20%	47,30%	-0,14
Impairment <i>t</i> , Non-Impairment <i>t</i> +1	41,06%	39,80%	0,11	34,15%	32,40%	0,15	41,39%	40,31%	0,06	24,52%	33,64%	-0,86	28,27%	45,31%	-1,22
Non-Impairment <i>t</i> , Impairment <i>t</i> +1	43,23%	46,17%	-0,08	41,18%	38,55%	0,23	52,58%	33,64%	1,33	50,14%	29,42%	0,97	62,23%	18,38%	2,48**
Non-Impairment <i>t</i> , Non-Impairment <i>t</i> +1	42,37%	40,92%	0,16	44,17%	37,37%	0,69	29,48%	40,01%	-0,90	37,67%	59,60%	-2,09**	50,25%	46,85%	0,37
									(11,33%)			(18,22%)			(3,40%)
									(19,01%)			(2,33%)			
Panel C: Services															
Impairment <i>t</i> , Impairment <i>t</i> +1	64,64%	62,70%	0,12	64,39%	55,40%	0,63	48,97%	61,08%	-0,72	81,83%	77,38%	0,38	71,32%	66,62%	0,28
Impairment <i>t</i> , Non-Impairment <i>t</i> +1	40,15%	33,78%	0,27	-	-	-	45,62%	42,10%	0,29	38,89%	36,93%	0,19	64,65%	38,20%	1,03
Non-Impairment <i>t</i> , Impairment <i>t</i> +1	62,20%	56,83%	0,27	43,46%	47,20%	-0,29	33,27%	39,80%	-0,33	-	-	-	48,98%	59,75%	-0,66
Non-Impairment <i>t</i> , Non-Impairment <i>t</i> +1	46,37%	43,25%	0,26	39,98%	36,42%	0,18	58,28%	44,55%	0,50	45,70%	39,01%	0,51	37,21%	41,13%	-0,38

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only *p*-values below 20% indicated in parentheses. The most significant values highlighted in bold.

9.2 Firm performance measured with Earnings Before Taxes Excluding Unusual Items to Sales

	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011						
	2006	2007	t	2007	2008	t	2008	2009	t	2009	t	2010	2011	t	
Panel A: Durable Manufacturers															
Impairment t, Impairment t+1	49,55%	57,25%	-0,31	83,53%	83,57%	0,00	70,33%	54,20%	0,54	57,40%	0,35	54,20%	28,40%	29,15%	0,28
Impairment t, Non-Impairment t+1	39,51%	59,51%	-1,33 (10,53%)	27,25%	38,40%	-0,36	54,20%	39,98%	0,40	45,23%	0,45	54,91%	35,56%	34,33%	0,34
Non-Impairment t, Impairment t+1	85,35%	93,00%	-3,16	59,45%	47,38%	0,61	42,53%	23,53%	0,24	45,33%	0,33	33,28%	58,58%	60,42%	0,59
Non-Impairment t, Non-Impairment t+1	53,19%	48,76%	0,44	49,35%	44,58%	0,55	48,05%	51,53%	0,48	50,99%	0,51	56,34%	54,02%	55,89%	0,54
Panel B: Technology															
Impairment t, Impairment t+1	-	-	-	43,85%	11,35%	0,74	29,35%	35,93%	-0,32	34,47%	-0,21	40,87%	47,30%	52,60%	-0,11
Impairment t, Non-Impairment t+1	31,79%	45,07%	-1,12	68,40%	84,20%	-3,19** (4,29%)	51,69%	63,54%	-0,74	29,08%	0,71	23,44%	29,79%	41,30%	-0,65
Non-Impairment t, Impairment t+1	45,00%	39,73%	0,16	56,27%	50,82%	0,42	55,06%	36,80%	1,13 (14,74%)	41,70%	0,80	21,72%	48,20%	18,80%	1,93* (5,61%)
Non-Impairment t, Non-Impairment t+1	45,86%	48,35%	-0,23	39,49%	42,17%	-0,28	40,59%	40,88%	-0,03	53,58%	-0,51	57,09%	48,25%	48,85%	-0,07
Panel C: Services															
Impairment t, Impairment t+1	77,62%	80,36%	-0,22	73,91%	78,40%	-0,48	72,50%	71,20%	0,14	87,23%	-0,19	89,18%	89,76%	89,76%	0,00
Impairment t, Non-Impairment t+1	74,93%	77,40%	-0,27	-	-	-	71,92%	75,45%	-0,55	58,21%	-0,15	59,34%	76,40%	77,40%	-0,13
Non-Impairment t, Impairment t+1	81,83%	75,93%	0,54	71,53%	69,95%	0,23	67,27%	67,90%	-0,03	-	-	-	75,95%	74,48%	0,14
Non-Impairment t, Non-Impairment t+1	68,58%	69,56%	-0,12	69,34%	72,88%	-0,22	85,25%	88,68%	-0,51	79,04%	0,47	76,26%	66,61%	66,75%	-0,02

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only p-values below 20% indicated in parentheses. The most significant values highlighted in bold.

9.3 Firm performance measured with Weighted Average

	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011						
	2006	2007	2007	2008	2008	2009	2009	2010	2010	2011					
Panel A: Durable Manufacturers															
Impairment t, Impairment t+1	50,33%	51,11%	-0,03	77,65%	79,45%	-0,34	62,65%	64,00%	0,63	49,70%	64,00%	0,50	35,35%	39,18%	0,35
Impairment t, Non-Impairment t+1	44,14%	54,79%	-0,78	27,65%	38,41%	-0,35	53,99%	34,59%	0,35	58,31%	52,14%	0,52	40,94%	38,95%	0,39
Non-Impairment t, Impairment t+1	85,73%	88,03%	-0,20	57,78%	46,88%	0,78	37,38%	43,03%	0,37	33,80%	32,39%	0,32	51,04%	52,12%	0,51
Non-Impairment t, Non-Impairment t+1	49,78%	47,39%	0,29	46,83%	44,29%	0,33	47,89%	49,06%	0,48	51,04%	53,63%	0,51	54,73%	50,17%	0,50
Panel B: Technology															
Impairment t, Impairment t+1	-	-	-	46,48%	24,95%	0,44	31,11%	42,50%	-0,72	45,28%	35,03%	0,52	44,25%	49,95%	-0,12
Impairment t, Non-Impairment t+1	36,42%	42,44%	-0,54	51,28%	58,30%	-2,10 (14,12%)	46,54%	51,93%	-0,43	26,80%	28,54%	-0,27	29,03%	43,31%	-0,98 (17,40%)
Non-Impairment t, Impairment t+1	44,12%	42,95%	0,03	48,73%	44,69%	0,41	53,82%	35,22%	1,41 (10,01%)	45,92%	25,57%	0,92	55,21%	18,59%	2,43** (2,97%)
Non-Impairment t, Non-Impairment t+1	44,12%	44,64%	-0,06	41,83%	39,77%	0,24	35,03%	40,45%	-0,55 (3,78%)	45,63%	58,35%	-1,85** (3,78%)	49,25%	47,85%	0,18
Panel C: Services															
Impairment t, Impairment t+1	71,13%	71,53%	-0,03	69,15%	66,90%	0,20	60,73%	66,14%	-0,43	84,53%	83,28%	0,12	80,54%	78,19%	0,21
Impairment t, Non-Impairment t+1	57,54%	55,59%	0,17	-	-	-	58,77%	58,78%	0,00	48,55%	48,14%	0,10	70,53%	57,80%	1,00
Non-Impairment t, Impairment t+1	72,01%	66,38%	0,45	57,50%	58,58%	-0,12	50,27%	53,85%	-0,30	-	-	-	62,46%	67,11%	-0,38
Non-Impairment t, Non-Impairment t+1	57,47%	56,40%	0,13	54,66%	54,65%	0,00	71,76%	66,61%	0,39	62,37%	57,63%	0,60	51,91%	53,94%	-0,32

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only p-values below 20% indicated in parentheses. The most significant values highlighted in bold.

Table 10 - Longitudinal global analysis using *t*-test**10.1 Firm performance measured with Operating Cash Flow to Sales**

	2006 vs. 2007			2007 vs. 2008			2008 vs. 2009			2009 vs. 2010			2010 vs. 2011		
	2006	2007	<i>t</i>	2007	2008	<i>t</i>	2008	2009	<i>t</i>	2009	2010	<i>t</i>	2010	2011	<i>t</i>
Impairment t, Impairment t+1	60,30%	51,79%	0,75	63,68%	57,58%	0,59	46,09%	61,29%	-2,01	62,16%	61,70%	0,05	58,18%	58,46%	-0,03
Impairment t, Non-Impairment t+1	43,85%	42,45%	0,16	40,07%	44,09%	-0,19	45,62%	42,10%	0,28	47,08%	40,65%	0,84	40,72%	45,06%	-0,47
Non-Impairment t, Impairment t+1	61,19%	59,10%	0,16	45,50%	43,68%	0,34	41,76%	43,20%	-0,15	34,96%	30,46%	0,50	48,88%	41,70%	0,95 (17,49%)
Non-Impairment t, Non-Impairment t+1	44,92%	43,47%	0,33	43,70%	40,47%	0,66	42,67%	44,10%	-0,24	45,22%	50,42%	-1,02	47,69%	44,20%	0,72

10.2 Firm performance measured with Earnings Before Taxes Excluding Unusual Items to Sales

	2006 vs. 2007			2007 vs. 2008			2008 vs. 2009			2009 vs. 2010			2010 vs. 2011		
	2006	2007	<i>t</i>	2007	2008	<i>t</i>	2008	2009	<i>t</i>	2009	2010	<i>t</i>	2010	2011	<i>t</i>
Impairment t, Impairment t+1	65,82%	70,27%	-0,44	71,31%	68,52%	0,28	59,55%	56,26%	0,40	62,45%	58,53%	0,33	66,69%	68,03%	-0,11
Impairment t, Non-Impairment t+1	44,38%	57,87%	-1,53	48,56%	59,44%	-0,49	71,92%	75,45%	-0,42	47,76%	48,26%	-0,30	38,14%	45,61%	-0,74
Non-Impairment t, Impairment t+1	70,33%	67,66%	0,21	62,87%	57,38%	0,99 (16,35%)	54,97%	41,66%	1,39 (9,30%)	46,08%	31,90%	1,39 (9,17%)	60,13%	54,29%	0,69
Non-Impairment t, Non-Impairment t+1	54,47%	53,92%	0,11	48,12%	47,28%	0,16	49,75%	52,12%	-0,41	59,66%	62,14%	-0,56	56,11%	56,97%	-0,20

10.3 Firm performance measured with Weighted Average

	2006 vs. 2007			2007 vs. 2008			2008 vs. 2009			2009 vs. 2010			2010 vs. 2011		
	2006	2007	<i>t</i>	2007	2008	<i>t</i>	2008	2009	<i>t</i>	2009	2010	<i>t</i>	2010	2011	<i>t</i>
Impairment t, Impairment t+1	63,06%	61,03%	0,19	67,50%	63,05%	0,48	52,82%	58,78%	-0,85	62,31%	60,12%	0,24	62,43%	63,24%	-0,07
Impairment t, Non-Impairment t+1	44,11%	50,16%	-0,75	44,31%	51,76%	-0,35	58,77%	58,78%	0,00	46,42%	44,46%	0,26	39,43%	45,34%	-0,66
Non-Impairment t, Impairment t+1	65,76%	63,38%	0,20	54,19%	50,53%	0,81	48,37%	42,43%	0,80	40,52%	31,18%	1,00 (16,44%)	54,51%	48,00%	0,83
Non-Impairment t, Non-Impairment t+1	49,69%	48,69%	0,24	45,91%	43,88%	0,45	46,21%	48,11%	-0,35	52,44%	56,28%	-0,93 (17,64%)	51,90%	50,59%	0,33

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. Only *p*-values below 20% indicated in parentheses. The most significant values highlighted in bold.

Table 11 - Longitudinal analysis by industry using Wilcoxon Rank Sum test**11.1 Firm performance measured with Operating Cash Flow to Sales**

	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011						
	2006	2007	Sig.	2007	2008	Sig.	2008	2009	Sig.	2009	2010	Sig.	2010	2011	Sig.
Panel A: Durable Manufacturers															
Impairment t, Impairment t+1	18,5	17,5		9	12		14,5	21,5		6	15		4	6	
Impairment t, Non-Impairment t+1	53	52		14,5	21,5		22,5	13,5		65	40		51,5	53,5	
Non-Impairment t, Impairment t+1	5	5		43,5	34,5		8	13		42	36		106	104	
Non-Impairment t, Non-Impairment t+1	335	331		364,5	376,5		375,5	365,5		295	300		222	184	
Panel B: Technology															
Impairment t, Impairment t+1	2	1		5,5	4,5		16	20		13	8		4,5	5,5	
Impairment t, Non-Impairment t+1	52	53		5	5		69,5	66,5		24	31		44,5	60,5	
Non-Impairment t, Impairment t+1	9,5	11,5		109,5	100,5		33	22		30,5	24,5		25	11	*
Non-Impairment t, Non-Impairment t+1	300	295		251,5	213,5		138	162		159,5	246,5	**	239,5	225,5	(2,28%)
Panel C: Services															
Impairment t, Impairment t+1	28	27		57	48		32,5	45,5	**	18,5	17,5		29	26	
Impairment t, Non-Impairment t+1	19,5	16,5		2	1		110,5	99,5		53,5	51,5		6	4	
Non-Impairment t, Impairment t+1	18,5	17,5		101	109		9,5	11,5		2	1		16	20	
Non-Impairment t, Non-Impairment t+1	154,5	145,5		29	26		19	17		159	141		192,5	213,5	

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. For larger samples, which allow normal approximation, *p*-values below 20% indicated in parentheses. The most significant values highlighted in bold.

11.2 Firm performance measured with Earnings Before Taxes Excluding Unusual Items to Sales

	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011	
	2006	2007	2007	2008	2008	2009	2009	2010	2010	2011
Panel A: Durable Manufacturers										
Impairment t, Impairment t+1	15	21	12	9	20,5	15,5	13	8	4,5	5,5
Impairment t, Non-Impairment t+1	43	62	15	21	20,5	15,5	49	56	49	56
Non-Impairment t, Impairment t+1	3	7	44	34	12	9	46	32	109	101
Non-Impairment t, Non-Impairment t+1	345,5	320,5	387,5	353,5	347	394	286	309	195	211
Panel B: Technology										
Impairment t, Impairment t+1	1,5	1,5	5	5	16,5	19,5	9	12	4	6
Impairment t, Non-Impairment t+1	44,5	60,5	3	7	59	77	30,5	24,5	45	60
Non-Impairment t, Impairment t+1	10,5	10,5	111	99	32,5	22,5	32,5	22,5	24	12
Non-Impairment t, Non-Impairment t+1	290,5	304,5	220,5	244,5	148	152	195,5	210,5	231	234
Panel C: Services										
Impairment t, Impairment t+1	25,5	29,5	48	57	40	38	17	19	27,5	27,5
Impairment t, Non-Impairment t+1	17	19	1,5	1,5	96,5	113,5	48	57	5	5
Non-Impairment t, Impairment t+1	19	17	109	101	10,5	10,5	1	2	18,5	17,5
Non-Impairment t, Non-Impairment t+1	146,5	153,5	26	29	17,5	18,5	156	144	202,5	203,5

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. For larger samples, which allow normal approximation, *p*-values below 20% indicated in parentheses. The most significant values highlighted in bold.

11.3 Firm performance measured with Weighted Average

	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011	
	2006	2007	2007	2008	2008	2009	2009	2010	2010	2011
Panel A: Durable Manufacturers										
Impairment t, Impairment t+1	18	18	10	11	18,5	17,5	9	12	4	6
Impairment t, Non-Impairment t+1	46	59	14,5	21,5	22	14	56	49	51,5	53,5
Non-Impairment t, Impairment t+1	5	5	45	33	10	11	43	35	105	105
Non-Impairment t, Non-Impairment t+1	342	324	372	369	369	372	287,5	307,5	212,5	193,5
Panel B: Technology										
Impairment t, Impairment t+1	2	1	5	5	15,5	20,5	12	9	4	6
Impairment t, Non-Impairment t+1	48,5	56,5	3	7	63	73	28	27	46,5	58,5
Non-Impairment t, Impairment t+1	10	11	108,5	101,5	36	19	*	31,5	23,5	11
Non-Impairment t, Non-Impairment t+1	296,5	298,5	240	225	138	162	169,5	236,5	*	240
									(6,19%)	225
Panel C: Services										
Impairment t, Impairment t+1	28	27	54	51	35	43	**	18,5	17,5	28
Impairment t, Non-Impairment t+1	18,5	17,5	2	1	106,5	103,5	54	51	6	4
Non-Impairment t, Impairment t+1	21	15	104,5	105,5	10	11	2	1	17	19
Non-Impairment t, Non-Impairment t+1	150	150	29	26	18	18	159	141	192,5	213,5

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. For larger samples, which allow normal approximation, *p*-values below 20% indicated in parentheses. The most significant values highlighted in bold.

Table 12 - Longitudinal global analysis using Wilcoxon Rank Sum test**12.1 Firm performance measured with Operating Cash Flow to Sales**

	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011	
	2006	Sig.	2007	Sig.	2008	Sig.	2009	Sig.	2010	Sig.
Impairment t, Impairment t+1	106,5	103,5	150	150	171,5	179,5	105	105	85,5	85,5
Impairment t, Non-Impairment t+1	329,5	336,5	48,5	56,5	470,5	519,5	318	423	238	290
Non-Impairment t, Impairment t+1	33	34	706	672	126,5	126,5	160,5	139,5	362	304
Non-Impairment t, Non-Impairment t+1	2266,5	2198,5	1587	1494	1227	1258	1772	1969	1939,5	1801,5

12.2 Firm performance measured with Earnings Before Taxes Excluding Unusual Items to Sales

	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011	
	2006	Sig.	2007	Sig.	2008	Sig.	2009	Sig.	2010	Sig.
Impairment t, Impairment t+1	100	110	150	150	200	200	105	105	85,5	85,5
Impairment t, Non-Impairment t+1	312,5	353,5	47,5	57,5	556,5	350,5	79,5	56,5	267	261
Non-Impairment t, Impairment t+1	32,5	34,5	742	636	143	110	170,5	129,5	352,5	313,5
Non-Impairment t, Non-Impairment t+1	2239	2226	1552	1529	1209,5	1276	1847	1894	1815	1926

12.3 Firm performance measured with Weighted Average

	2006 vs. 2007		2007 vs. 2008		2008 vs. 2009		2009 vs. 2010		2010 vs. 2011	
	2006	Sig.	2007	Sig.	2008	Sig.	2009	Sig.	2010	Sig.
Impairment t, Impairment t+1	108	102	150	150	199	207	105	105	85,5	85,5
Impairment t, Non-Impairment t+1	317,5	348,5	48,5	56,5	533	457	311	430	259	269
Non-Impairment t, Impairment t+1	36	31	725	653	141	112	167,5	132,5	353	313
Non-Impairment t, Non-Impairment t+1	2252,5	2212,5	1566	1515	1224,5	1260,5	1774	1967	1902,5	1838,5

Note: Statistical significance indicated by ***, **, and * for 1%, 5%, and 10% level, respectively. For larger samples, which allow normal approximation, *p*-values below 20% indicated in parentheses. The most significant values highlighted in bold.

5.5 Managerial implications

The results from both sets of analyses are clearly different and can be explained using the argument presented by Vichitsarawong (2007). On the one hand, the cross-sectional analysis compares relative firm performance at an industry level. Management does not have the ability to manage the performance of other firms and therefore this type of analysis yields results more consistent with the expected relationship. In that sense, it conveys the usefulness of the accounting standards introduced by IFRS 3 (2004) and IAS 36 (2004). On the other hand, the longitudinal analysis is performed at the company level. In this case, the management is accountable for financial reporting presentation and disclosures. Thus, one could assume a potential of manipulation of firm performance by managers along the years.

Although the purpose of the dissertation is not to test the hypothesis of earnings management, the systematic failure at proving the longitudinal hypotheses might suggest, even if not strongly supported, earnings management practices by Germany companies in the context of goodwill impairment tests and decisions regarding the recognition of goodwill impairment.

In order to understand this problematic, it is important to examine former literature about the topic, and more specifically in Europe.

In fact, with the aim of maximizing firms' profits and stock value, managers may be, occasionally, incentivized to make use of earnings management practices (Jiraporn, Kim et al., 2008; Jiraporn, Miller et al., 2008).

In what concerns to the motives to engage in such practices, Iatridis & Kadorinis (2009) uses UK firms to conclude about the tendency of firms to use earnings management in order to present better financial results, to increase the levels of compensation and to meet or exceed financial analysts' forecasts regarding firm's earnings. Particularly, companies with low profitability and high leverage measures are more likely to engage in earnings management techniques.

Also Chen et al. (2010) suggests that companies are more likely to manage earnings as an attempt to avoid earnings decreases rather than as a method to avoid negative earnings. Nonetheless, surprisingly, the frequency of earnings managements is even higher when managers try to present results in line with analysts' forecasted earnings. The authors state that this trend has been magnified in recent years, especially after the year of 2001.

According to Duh et al. (2009), managers recognizing more impairment losses tend to reverse the impairment losses in the situations in which incurring in such practices will prevent

earnings decrease in subsequent periods. Moreover, these practices are more common in firms with higher debt ratios.

Particularly when engaging in earnings management practices, managers make use of two components of earnings: cash from operations and changes in working capital (Burgstahler & Dichev, 1997).

Regarding the goodwill impairment topic, some authors question whether the new accounting approach actually delivers better information about goodwill or is more understood as a new opportunity for creative accounting (Jerman & Manzin, 2008). Watts (2003) argues that new standards on business combinations and goodwill have contributed to the increase of uncertain estimates in financial reporting, especially in the case of goodwill impairment tests. As a consequence, the manipulation of earnings and net assets values will tend to increase.

In fact, the new accounting treatment thrives in subjective decisions taken by managers. For instance, fair value estimation of assets and liabilities may bolster the probability of earnings management. In the absence of a market reference, the level of subjectivity and uncertainty tends to increase, and consequently the usefulness of the information will decrease (Jerman & Manzin, 2008). Additionally, the process of defining an operating unit (under US GAAP) or a cash-generating unit (under IFRS) is a subjective issue. In the limit, firms may create units in a higher level which allows the concealment of possible impairment (Jerman & Manzin, 2008).

Alternatively, Gu & Lev (2011) analyze goodwill impairment losses as a consequence of acquisitions conducted by firms presenting overvalued share prices at the moment of the transaction. The authors found not only a positive relation between share overpricing and number and size of corporate acquisitions, but also a positive relationship between share overpricing and increases in the amount of goodwill recognition, inducing overpayment and consequent future possible goodwill impairments.

In addition, Olante (2013) discovers that the amount of the purchase price assigned to goodwill is strongly and positively in line with impairment losses recognition. Being so, when the proportion of the acquisition price resulting in goodwill is considerably high, the value of goodwill has a higher probability of including other elements that exceed expected synergies from the combination and the going concern value of the target company. In this case, goodwill is unlikely to represent fairly the underlying economics. However, the author also finds out that SFAS 142 (2001) helps to reduce this shortcoming, by reducing the time to detect the situations in which goodwill impairment should be written off.

Looking at the particular case of Germany, as a stakeholder economy, and when compared to shareholder-oriented approaches, GAAP regulation regarding recognition and estimation of accrual and reserves are more liberal and consequently they exhibit a greater level of managerial discretion in manipulating reported performance (Ball et al, 2004; Bartov, et al., 2005). Thus, some studies suggest poor accounting quality in Germany relatively to shareholder-based economies. Firstly, Alford et al. (1993); Ball et al. (2000) conclude that earnings in this country are less timely and also less sensitive to economic losses. Secondly, Bhattacharya et al. (2003); Leuz et al. (2003) discover higher levels of earnings management and smoothing within Germans.

In conclusion, although past literature may suggest manipulation of results by managers in general, there is not a clear evidence of such practices with regards to the goodwill impairment topic. In that sense, this hypothesis is presented with little support.

CHAPTER 6

CONCLUSION

6.1 Summary and conclusions

Overall, findings for both analyses are clearly different, leading to different conclusions.

In what concerns to the cross-sectional analysis, findings show discrepancies between different types of performance measurement. Considering the argument presented by Miller et al. (1988), based on the idea that many managers have preferred evaluation techniques relying on cash flows rather than those based on profits, it is possible to partially validate hypothesis A, by revealing that impairment firms are significantly less efficient when comparing to non-impairment firms in the period of goodwill impairment recognition. These conclusions are consistent with the conclusions obtained by Vichitsarawong (2007), who finds strong evidence that United States impairment firms are relatively less efficient than United States non-impairment firms in the year of goodwill impairment recognition.

Concerning the longitudinal analysis, results do not support the hypotheses that Germany firms are relatively less efficient in the year of goodwill impairment when compared to the year of no impairment. This is consistent for different types of performance measurement and for both industry and global analyses. Likewise, in his study based on United States companies, Vichitsarawong (2007) only partially supports the longitudinal hypotheses.

The explanation of these divergences is suggested by Vichitsarawong (2007). The cross-sectional analysis compares relative firm performance at an industry level and therefore management does not have the ability to manage the performance of other firms, leading to results that are more consistent with the expected relationship. However, in the longitudinal analysis, the focus is on the company for a specific period of time. In this case, some manipulation of firm performance by managers over the years can be conceived. Consequently, the inability to prove the longitudinal hypotheses might suggest, even if not strongly supported, earnings management practices by Germany companies in the context of goodwill impairment tests and decisions about recognition of goodwill impairments.

6.2 Limitations of the study

Regarding the limitations of the study, the main drawback to mention is undoubtedly the small sample size. This limitation may be analyzed at three different levels.

Firstly, assuming that the ultimate objective of the dissertation is to obtain conclusions at a European level, the use of only one country only, Germany, may inhibit the extrapolation of the conclusion for all the European countries using IFRS. Still, Germany is considered to be an adequate representation of the European reality, as the largest economy in Europe.

Secondly, the limitation is also a result of the focus on three specific industries, considered to be extremely active in mergers and acquisitions and also presenting a significant incidence of goodwill impairment losses. Nevertheless, this conclusion is obtained from Vichitsarawong (2007) through a sample exclusively composed of United States companies and for a specific period of analysis (from 2002 to 2005). Since this study is focused on a different environment and on a subsequent and larger period of analysis, the most relevant industries to consider might not be the same. Assuming each industry presents specific particularities, the choice of the industries to include in the analyses might have significant impact on conclusions.

Thirdly, even when focusing solely on the Germany reality, sample size is conditioned by the lack of data availability in the data source that is used.

Firm performance measurement represents the second limitation of this dissertation. The reliance on distinct definitions of performance variables represents an attempt to minimize such limitation. Notwithstanding, the findings convey the importance of firm performance measurement in the confirmation of the hypotheses. In that sense, a stronger and more solid metric should have been tested.

In addition, the date of goodwill recognition (resulting from a business combination) to which the impairment loss is related to is not taken into account. Possibly, since the period of analysis starts in 2005 and the changes in goodwill accounting treatment under IFRS were introduced in 2004, the goodwill of sample firms was already subject to yearly depreciation and consequently the chances of impairment recognition are reduced from that moment on. Likewise, there is no consideration for the weight and impact of the goodwill impairment in the overall business, as well as the frequency of write-offs, since the only requirement to define an impairment firm is the existence of at least one case of goodwill impairment recognition during the period between 2006-2011.

Finally, the statistical tests related to over-time analysis are unable to reject the null hypothesis and therefore to confirm the suggested hypotheses. As a result, only the cross-

sectional hypothesis is supported (although for a specific type of performance measure) and the earnings management hypothesis is developed on an insufficient basis and with fragile statistical support. For instance, audit opinion regarding financial reporting of such companies could report managers' opportunistic incentives. However, this aspect is not analyzed in the present study.

6.3 Suggestions for future research

Taking the limitations described in the previous section into account, further research may be developed in the future.

In the first place, the same study could be conducted relying on larger samples including more than one European country. In that sense, it would be interesting to consider not only other similar countries such as France or United Kingdom, but also countries strongly affected by the financial and sovereign debt crisis (the effects of which should be clearly emphasized over the period of analysis), such as Spain, Portugal or even Italy. In this case, it would be useful to establish comparisons among countries, as overall conclusions would be strengthened, given the more extensive representation of the European reality. At the same time, an extension to other relevant industries in the mergers and acquisition landscape (and associated recognition of goodwill impairment losses) in Europe could add value to the group of industries already taken into consideration. From a conservative perspective, assuming there are no predominant industries concerning this topic, a sample including companies from a wider range of industries (i.e., more than three) would be even more reliable. However, it is important to evaluate if the additional level of complexity brought by the consideration of a wide variety of industries would be compensated by the increase in accuracy that such option could convey.

In the second place, the same type of study should be conducted while using a more precise measure of firm performance. For instance, other type of financial variables, previously applied in other researches that evaluated changes in firm performance, could be considered. Relevant examples are sales growth, *Tobin's q* or market to book ratio. A further alternative would be to use Data Envelopment Analysis in order to measure relative efficiency, an approach followed by Vichitsarawong (2007). This measure allows the combination of

different financial measures into a meaningful measure of overall performance (Bowlin, 1995).

Finally, given the results of this particular dissertation, it would be valuable to deepen the study of earnings management practices regarding goodwill impairment. In fact, some research has been made regarding manipulation of results in Europe, but not particularly related to goodwill impairment tests and decisions on the recognition of such losses. Therefore, it would be valuable to analyze to what extent goodwill impairment recognition is determined by annual firm performance.

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APPENDICES

Appendix 1 – List of sample firms

Panel A: Durable manufacturers

ID	Impairment firms	ID	Non-impairment firms
1	PVATePla AG (XTRA:TPE)	54	M.A.X. Automation Ag (DB:MXH)
7	Impreglon SE (XTRA:I3M)	58	Saint-Gobain Oberland AG (DB:OLG)
8	Nanogate AG (XTRA:N7G)	61	H.P.I. Holding Aktiengesellschaft (DB:HP3)
12	PNE Wind AG (XTRA:PNE3)	62	Nordwest Handel AG (DB:NWX)
13	Neschen AG (DB:NSN)	63	Schulte-Schlagbaum AG (DUSE:SSS)
14	Rucker AG (XTRA:RUK)	64	Schumag Aktiengesellschaft (DB:SCM)
15	Masterflex SE (XTRA:MZX)	65	AS Creation Tapeten AG (DB:ACWN)
21	Südwestdeutsche Salzwerte AG (DB:SSH)	67	Piper Generalvertretung Deutschland AG (DB:PIP)
25	Wacker Neuson SE (DB:WAC)	68	HOMAG Group AG (DB:HG1)
26	Alno AG (DB:ANO)	70	Nordex SE (XTRA:NDX1)
27	CENTROTEC Sustainable AG (XTRA:CEV)	71	Deutsche Steinzeug Cremer & Breuer AG (DB:DSK)
28	KUKA Aktiengesellschaft (DB:KU2)	72	Pfeiffer Vacuum Technology AG (DB:PFV)
30	VBH Holding AG (DB:VBH)	73	Innotec TSS AG (DB:TSS)
33	Sto AG (DB:STO3)	74	Balda AG (XTRA:BAD)
34	Bien-Zenker AG (DB:BIE)	76	Villeroy & Boch AG (DB:VIB3)
36	Helma Eigenheimbau AG (XTRA:H5E)	77	Heidelberger D. Aktiengesellschaft (DB:HDD)
38	Muehlhan AG (XTRA:M4N)	78	AVW Immobilien AG (DB:AV7)
39	Elexis AG (XTRA:EEX)	82	DESIGN Bau AG (XTRA:D2B)
40	Energiekontor AG (DB:EKT)	83	Koenig & Bauer AG (DB:SKB)
41	H. Druckmaschinen Aktiengesellschaft (DB:HDD)	88	SMA Solar Technology AG (XTRA:S92)
42	Jenoptik AG (XTRA:JEN)	89	LEWAG Holding Aktiengesellschaft (DB:KGR)
44	Koenig & Bauer AG (DB:SKB)	91	Dürr Aktiengesellschaft (DB:DUE)
2	BASF SE (DB:BAS)		
3	ThyssenKrupp AG (XTRA:TKA)		
4	Continental AG (DB:CON)		
9	Wacker Chemie AG (XTRA:WCH)		
10	Evonik Industries AG (DB:EVK)		
11	Lanxess AG (XTRA:LXS)		
17	Heraeus Holding GMBH		
18	Salzgitter AG (DB:SZG)		
23	CLAAS KGaA mbH		
32	HeidelbergCement AG (DB:HEI)		
43	Jungheinrich AG (DB:JUN3)		

Panel B: Technology

ID	Impairment firms	ID	Non-impairment firms
1	KPS AG (DB:KSC)	48	Software AG (XTRA:SOW)
5	COMPAREX Deutschland AG	50	Data Modul AG (DB:DAM)
6	DocCheck AG (DB:AJ91)	52	Matica Technologies AG (XTRA:D7S)
8	itelligence AG	53	SQS Software Quality Systems AG (AIM:SQS)
9	NorCom Inf. Technology AG (XTRA:NC5)	54	Wincor Nixdorf Aktiengesellschaft (XTRA:WIN)
10	NTT Com Security AG (XTRA:AAGN)	55	All for One Steeb AG (XTRA:A1OS)
13	United Internet AG (DB:UTDI)	56	artec technologies AG (DB:A6T)
14	Beta Systems Software AG (DB:BSS)	57	Transtec AG (DB:TTC)
15	CompuGroup Medical AG (DB:COP)	59	Bechtle AG (XTRA:BC8)
16	COR&FJA AG (XTRA:FJH)	60	Nexus AG (XTRA:NXU)
17	CPU Softwarehouse AG (DB:CPU2)	62	SNP Schneider-Neureither & Part. AG (DB:SHF)
21	Mensch und Maschine Software SE (DB:MUM)	64	Triplan AG (XTRA:TPN)
24	Pixelpark AG (XTRA:PXL1)	65	FRIWO AG (DB:CEA)
25	primion Technology AG (XTRA:P4T)	66	ATOSS Software AG (XTRA:AOF)
26	SHS VIVEON AG (XTRA:SHW)	68	Caatoosee AG (DB:COO2)
27	Softing AG (XTRA:SYT)	69	cycos AG (DB:YOS)
28	USU Software AG (XTRA:OSP2)	70	Easy Software AG (XTRA:ESY)
29	CeoTronics AG (DB:CEK)	73	i:FAO AG (XTRA:FAO2)
32	Swarco Traffic Holding AG (DB:MTB)	74	IBS Aktiengesellschaft (XTRA:IBB)
33	TELES A. Informationstechnologien (XTRA:TLI)	75	INTERSHOP Communications A. (XTRA:ISH2)
39	First Sensor AG (XTRA:SIS)	76	Isra Vision AG. (XTRA:ISR)
40	HPI AG (DB:CEW3)	77	LS Telecom AG (XTRA:LSX)
43	SolarWorld AG (XTRA:SWV)	78	MAGIX AG (DB:MGX)
45	Suss MicroTec AG (XTRA:SMHN)	79	Pironet NDH AG (XTRA:PNG)
46	R. Stahl AG (DB:RSL2)	80	RealTech AG (XTRA:RTC)
47	Schaltbau Holding AG (DB:SLT)	83	Secunet Security Networks AG (XTRA:YSN)
67	B+S Bankssysteme Aktiengesellschaft (DB:DTD2)	84	Seven Principles AG (XTRA:T3T)
31	LEONI AG (DB:LEO)		
42	Roth & Rau AG (DB:R8R)		

Panel C: Services

ID	Impairment firms	ID	Non-impairment firms
10	Sedo Holding AG (XTRA:LKI)	45	Fidor Bank AG (DB:F5R)
13	Constantin Medien AG (XTRA:EV4)	46	Wige Media AG (XTRA:WIG)
14	Klassik Radio AG (XTRA:KA8)	50	CCR Logistics Systems AG (DB:CCR)
16	Sky Deutschland AG (XTRA:SKYD)	56	ORBIS AG (XTRA:OBS)
17	Allgeier SE (XTRA:AEI)	57	Telegate AG (XTRA:TGT)
18	Alphaform AG (XTRA:ATF)	58	3U Holding AG (XTRA:UUU)
19	Amadeus FiRe AG (XTRA:AAD)	62	Mox Telecom AG (XTRA:MOT)
21	Bremer L. G. Aktiengesellschaft (DB:BLH)	63	net mobile AG (XTRA:NIM)
22	Deufol SE (DB:DE1)	65	IFA Hotel & Touristik Aktiengesellschaft (DB:IFA)
26	Wirecard AG (XTRA:WDI)	66	CinemaxX AG (DB:MXC)
29	MME Moviemment AG (XTRA:MME)	68	Splendid Medien AG (XTRA:SPM)
30	Odeon Film AG (DB:ODE)	69	Studio Babelsberg AG
33	Travel24.com AG (DB:TVD6)	75	conVISUAL AG (XTRA:C1V)
41	Beate Uhse AG (XTRA:USE)	79	Bayerische Gewerbebau AG (DB:MUK)
2	Deutsche Telekom AG (DB:DTE)		
5	Münchener R. Gesellschaft Aktiengesellschaft		
6	RWE AG (DB:RWE)		
7	Deutsche Post AG (XTRA:DPW)		
8	ad pepper media Int. N.V. (XTRA:APM)		
12	Bertelsmann SE & Co. KGaA		
15	ProSiebenSat.1 Media AG (DB:PSM)		
34	TUI AG (DB:TUI1)		
35	Axel Springer AG (DB:SPR)		
36	Cash.Medien AG (DB:MF8)		
40	Maxingvest AG		
42	Celesio AG (DB:CLS1)		

NON-PLAGIARISM DECLARATION

I the undersigned, Sara Fontes Coutinho Mesquita Brandão, certify on the honor that I have not plagiarized the paper enclosed, which means that I am the only author of all the sentences this text is composed of. Any sentence from a different author than me was written in quotation marks, with explicit indication of its source. I am aware that by contravening to the present rule, I break the recognised academic principles and I expose myself to the sanctions the disciplinary committee will decide on.

I also confirm this work has never been submitted during studies prior to ESCP Europe.

If this work has been written during studies conducted in parallel, I must precise it.

The remarks written in those pages only commit me.

Paris, 12th of May 2014