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An Accounting Approach to Law and Finance

-A cross-European study using earnings multiples

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ABSTRACT

This research paper is an attempt to combine two extensively researched disciplines, namely the field of "Law and Finance" and the field of international accounting. "Law and Finance" theory finds that there are institutional differences between countries in the way the legal system protects minority shareholders, where higher minority shareholder protection ultimately leads to companies being valued higher by the market. However, in their methodology, previous studies on the field have to a great extent disregarded the large differences in accounting that also influence firm values. Based on financial data of 1026 companies, from 15 different European countries during 1995-2006, this paper empirically analyzes if using a methodology that adjusts for accounting differences alters the previous finding on "Law and Finance". Using earnings multiples as a tool, this study confirms that "Law and Finance" has an impact on firm values. Nonetheless, due to the overriding accounting discrepancies, the impact only becomes observable after controlling for financial reporting differences. Finally, since multiples are affected by "Law and Finance", the study examines if using multiples in the appraisal technique known as Multiple valuation has a distorting effect on the valuation. Here the study shows that due to how Multiple valuation is performed, the "Law and Finance" effect is leveled out.

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1 INTRODUCTION

This research paper is an attempt to combine two extensively researched disciplines, namely the field of "Law and Finance" and the field of international accounting. "Law and Finance" theory finds that there are institutional differences between countries in the way the legal system protects minority shareholders. The main implication of the "Law and Finance" theory is that firm values are higher in countries where minority shareholders enjoy better protection (La Porta, Lopez-De-Silanes, Shleifer and Vishny, 2002). On the other hand there is the field of international accounting, which again due to institutional differences between countries, has a determining effect on firm values. Previous academic studies on "Law on Finance" have generally disregarded the effect international accounting differences has on firm values. Our study tries to tighten this gap. Our research is an attempt to identify if cross-country accounting differences impact the methodology that previous studies have used to measure the "Law and Finance" effect on firm values. We will use earnings multiples as a tool to analyze this. By using two different earnings multiples, one which includes and one which eliminates the accounting discrepancies, we hope to find out if the accounting differences change the predictions made by "Law and Finance".

Our study is based on financial data of 1026 companies, from 15 different European countries, and covers the period of 1995 to 2006. Compared to other European countries, the UK has a legal system that protects minority shareholders better. Hence, "Law and Finance" theory states that UK firms have higher market values than have firms in other European countries. Over the period we analyze, before the implementation of IFRS, European accounting also differs substantially. First, our study will analyze if UK firms have higher multiples when no adjustments are made for the cross-European accounting differences. Secondly, after eliminating for the accounting differences, we are interested in exploring if the previous results change. Finally, since multiples are used to value companies by the technique called Multiple valuation, we want to see if Multiple valuation is also impacted by the "Law and Finance" effect (for a graphical illustration of our approach, see Chart 1 on the next page).

Our three main research questions are as follows:

1. *Is there a "Law and Finance" effect on multiples that **do not** adjust for accounting differences?*
2. *Is there a "Law and Finance" effect on multiples that **do** adjust for accounting differences?*
3. *Can we also observe a "Law and Finance" effect on a cross-European Multiple valuation?*

1.1 CONTRIBUTION

Our contribution is fourfold. First, we introduce the field of "Law and Finance" to the field of accounting. To our knowledge, this study is the first attempt to do so. Second, whereas previous research has focused on a market-to-book ratio in the form of Tobins Q, this study is

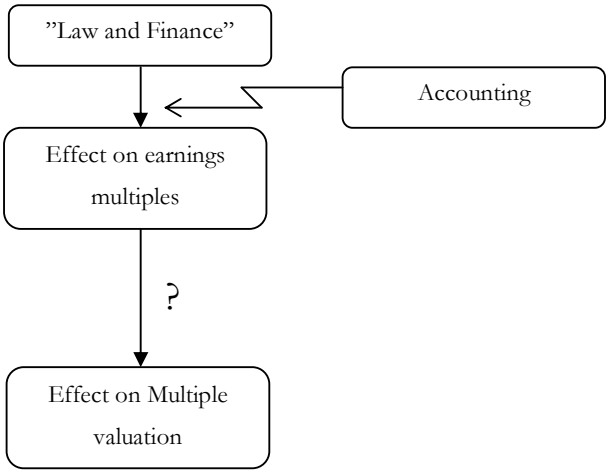
the first to examine if "Law and Finance" has an effect on earnings multiples. Third, the analysis will enhance the knowledge on how reliable the Multiple valuation model is. Fourth, based on a database of 1026 companies covering 15 countries, our study is done on a large scale.

1.2 OUTLINE OF THE PAPER

First, the paper elaborates on the theoretical background and previous findings of the two main areas which the paper focuses on, namely "Law and Finance" and accounting. Second, we will present our hypotheses. Thereafter we present our data, followed by the methodology that we use to analyze the data. Fifth, we present the empirical findings of our study and state whether or not we accept or reject our hypotheses. Next, we present several robustness checks in order to measure how reliable our results are. Finally, we conclude our paper by summing up our findings and discussing their implications.

Considering that our thesis uses substantial jargon from the "Law and Finance", accounting, multiples and statistics fields of research, we have compiled a dictionary which can be found in Appendix 10.1.

Chart 1. An illustration of our approach



2 THEORETICAL FRAMEWORK & PREVIOUS FINDINGS

This part of the paper will introduces the necessary background information related to our three research questions. First, we will present an introduction to the field of "Law and Finance" as well as to the field of multiples. Thereafter we will explain the influence of the former on the latter. Finally, we show how cross-country accounting differences cause earnings to be higher in the UK than in the rest of Europe, and how this affects earnings multiples.

2.1 THE IMPACT OF "LAW AND FINANCE" ON FIRM VALUE

2.1.1 An introduction to "Law and Finance"

The field of "Law and Finance" has emerged in the last few years as an attempt to explain cross-country differences in financial development, economic growth and firm values (Siems, 2006). These differences are explained by cross-country discrepancies in the legal and institutional settings. Research studies in "Law and Finance" generally build on the theory by the originators of the field, La Porta, Lopez-De-Silanes, Shleifer, and Vishny (1997, 1998), abbreviated as LLSV.[1]

The main result of LLSV (1997, 1998), which is at the center of the "Law and Finance" theory, is that an institutional setting with better protection of minority shareholders leads to a higher degree of financial development. Because the investors in countries with such institutional settings believe that they are better protected against expropriation, they are willing to invest more in firms. This causes the higher level of financial development and leads to higher firm values. LLSV (2002) show that firm values are higher using the market-to-book ratio Tobin's Q (calculated as a firm's market enterprise value divided by its total book value).

LLSV (1998) find that the current institutional setting in a country, and therefore the level of minority protection, depends on its legal history, or origin. This is because legal systems are not written from scratch, but rather inherited – voluntarily or involuntarily – from a few legal families or traditions. These can generally be classified as either common or civil law traditions.[2] Common law has its origin in England while civil law derives from Roman law. The key difference between common and civil law systems stems from the fact that the latter was formed in order to limit the legislative power of individual courts. The French civil law tradition, for example, was formed under Napoleon in the early 19th century specifically to eliminate the ability of judges to promote the interests of the French property owning elite. Conversely, judges in

[1] As a rough illustration of the growth of this field, in a simple search of academic papers we found 2797 papers referencing to LLSV (1998). By comparison, a similar search yielded 5920 papers citing Black and Scholes (1973), and 2854 referencing to Markowitz (1952).

[2] The distinction between common and civil law traditions is in itself is far from new, and originates in the field of comparative law (Siems, 2006)

common law countries have more influence. Thus, while common law is made by judges and subsequently incorporated into legislation, civil law is constructed centrally (LLSV, 1997). LLSV (1997) state that because of this, the English common law system provides minority shareholders with better legal protection and private property rights. Thus common law countries give the strongest minority protection and French civil law countries the weakest (LLSV, 1998). German and Scandinavian civil law countries generally fall in between these two groups.

2.1.2 Minority shareholder expropriation risk

LLSV's (2002) theory suggests that a rational investor will discount the risk of expropriation into the price he is willing to pay for a stock. They believe that investors are primarily worried about being exploited by the controlling shareholder. Such expropriation is referred to as extraction of private benefits of control. Because minority shareholders with a strong legal protection system are better protected against such expropriation, these investors are willing to pay more for shares in a firm. As a result, the firm value is predicted to be lower in countries with poor legal protection of minority shareholders.[3] LLSV (1997) therefore construct an index of anti-director rights to measure how well shareholders are protected against being exploited by a controlling shareholder. The index measures if, for example, proportional representation of minorities in the board of directors is allowed (See our dictionary in Appendix 10.1 for more information on this index). Using this measure, they find minority protection to be significantly stronger in common law than in civil law countries. The UK is the only common law country in our sample.[4] Consequently, their theory predicts that firm values will be higher in the UK than in the rest of Europe. A number of empirical studies show that this is indeed the case (Claessens and Laeven, 2003; Caprio, Laeven and Levine, 2003; LLSV, 2002). See Table A2 in Appendix 10.3 for a summary of these studies.

We can thus summarize the findings of LLSV (1997, 1998 and 2002) as follows:

- Legal origin determines the level of legal minority shareholder protection
- Better legal protection of minority shareholders causes investors to pay more for shares
- This drives financial development, and ultimately firm values

→ The main implication for our study is thus that higher minority shareholder protection leads to higher market values in the UK, everything else equal.

[3] For a more thorough discussion of private benefits and a typology thereof, see Ehrhardt and Nowak (2003). Examples of pecuniary benefits for instance occur in the form of excessive managerial compensation, cheap loans and guarantees (i.e. "tunneling"), or insider trading. Non-pecuniary benefits can be influencing public opinion or public decisions, owning a luxury brand, social prestige, or family tradition.

[4] For the sake of clarity, we have excluded Ireland from our analysis. Ireland is most commonly classified as a common law country (Siems, 2006). However, the Irish stock market is quite small. Thus this simplification should not have too large of an impact on our results.

2.1.3 Criticism against the "Law and Finance" theory

There is an extensive literature criticizing the works of LLSV (1997, 1998 and 2002). This criticism can generally be divided into two categories. First, some studies question the very basis of LLSV's (2002) results by questioning whether higher minority shareholder protection actually impacts financial development and firm values. Second, some studies instead question the relevance of legal origin, or history, in determining the current institutional setting. These studies, and their relevant conclusions for our paper, are summarized in Table A2 in Appendix 10.3. Below we will briefly describe these two types of criticism.

Criticism 1: Higher minority shareholder protection does not drive higher firm values

The notion that higher levels of minority shareholder protection directly leads to higher firm valuations is controversial. Holmén and Högfeldt (2002) study this mechanism within the Swedish institutional setting. They find that formal protection of investors does not directly affect share prices. Rather, informal protection of shareholders, chiefly in the form of concentrated ownership, makes up for the lack of legal protection. This process is encouraged for political purposes. However, this concentrated ownership presents managers with the opportunity to extract non-pecuniary benefits and escape reprimands for bad decision making. This, of course, depresses share prices. Generally, this Swedish example can be used to illustrate that the effect of minority shareholder protection on firm values is not as simple as LLSV (2002) assumes. Moreover, another group of studies have found that minority shareholder protection has little, if any, affect on share prices (Guiso, Sapienza and Zingales, 2000; Dyck and Zingales, 2002). Finally, when interviewing practitioners within the field of corporate valuation, we found that they generally assign little, if any, weight to the impact of the legal and institutional setting on share prices. The general opinion was that the effect was too weak to make any significant impact on market prices, not well proven empirically, and too difficult to quantify (Huc, interview on 01-02-2007).

Criticism 2: The legal origin of a country does not affect its financial development

There are a number of papers that argue against the methodology employed in LLSV's (1997, 1998) papers. Many of these oppose how shareholder protection is measured and try to introduce more accurate and precisely constructed indices than the original LLSV (1997) anti-director rights (Djankov, La Porta, Lopez-de-Silanes and Shleifer, 2005; Spamann, 2006). See our dictionary in Appendix 10.1 at the end of this paper for a description of these anti-director rights. Also, a few studies criticize the method of grouping countries together according to legal origin (Merryman, 1996; Acemoglu, Johnson and Robinson, 2003; Siems, 2006).[5]

[5] For example Siems (2006), as a comparative lawyer, argues that the number of countries for which the classification is far from clear constitute as much as 80% of the 129 firm sample of Djankov et al. (2005).

Furthermore, much of the criticism concerns the drivers or "factors" through which the current legal and institutional setting is formed. A burgeoning literature finds that political factors are more important than the legal origin of the country (Pound, 1991; Roe, 1994; Pagano and Volpin, 2001; Rajan and Zingales 2003; Haber, Razo and Maurer, 2003; Holmén and Högfeldt, 2002). However, a large number of studies also build on the existing literature concerning factors such as geography and history to explain the current institutional setting as well as financial development (Jones, 1981; Crosby, 1989; Engerman and Sokoloff, 1997).

→ The main implication for our study is that the "Law and Finance" effect is controversial. A large literature criticizing LLSV shows the relevance of questioning their results. This shows that we must test if higher multiples are actually driven by higher minority shareholder protection.

2.2 THE IMPACT OF "LAW AND FINANCE" ON MULTIPLES

2.2.1 An introduction to earnings multiples

Among other purposes, multiples are constructed as a tool for analyzing a company's value. This is achieved by dividing a firm's market price by some accounting measure. In particular, an earnings multiple is a ratio of the company's market value to an earnings measure such as net income. Moreover, as we will show, earnings multiples can be constructed to eliminate most influence of accounting differences between firms. Controlling for accounting is much more complicated for market-to-book multiples. One such multiple is Tobin's Q, which has been used by most previous studies on "Law and Finance".

Intuitively, earnings multiples can thus be thought of as measuring the price that the market is willing to pay for the earnings generated by a firm (Pinkowitz, Stulz and Williamson, 2006). The most commonly used earnings multiple is the well-known Price-to-Earnings multiple (P/E), which divides a company's market value by its earnings (Koller, Goedhart and Wessels, 2005). We wish to emphasize the difference between multiples and a Multiple valuation. Multiples refer to the ratios explained above. Multiple valuation, which we will use later in the study, is a technique of valuing a company by using multiples.

2.2.2 The impact of "Law and Finance" on earnings multiples

As we show above, the theory of "Law and Finance" states that higher minority shareholder protection in the UK leads to higher share prices. Consequently, an earnings multiple such as the P/E, which is a ratio of prices and earnings, should be higher in the UK than in the rest of Europe. The higher share price for UK firms goes into the P/E numerator and hence increases the overall multiple.

→ The main implication for our study is thus that the "Law and Finance" effect leads to higher P/E multiples in the UK, everything else equal.

2.3 THE IMPACT OF ACCOUNTING TRADITIONS ON MULTIPLES

2.3.1 Differences in European accounting practices

The financial reporting in a country is dependent on its institutional setting. This is because the accounting rules are designed for different purposes in different countries. Accounting traditions thus vary depending on what need they are meant to satisfy. This causes financial reporting to differ substantially between countries over the years that we study, 1995-2006. More specifically, this divergence is influenced by many factors including the providers of finance, the tax system, the accountancy profession, the legal system and conceptual basis (Mueller, Gernon, and Meek, 1991; Nobes, 1992; Nobes and Parker, 2000; Radebauch, Gray and Black, 2006).

In order to be able to compare and analyze the European market in a more effective way, several academics have tried to classify or cluster the different accounting traditions. Some attempts focus on the orientation of the accounting towards the needs of the stock market and investors (Nobes, 1980, 1998). Others make classifications based on cultural influences (Mueller et al., 1991; Radebauch et al., 2006). For schematic representations of both the equity market and the cultural influence model, see Appendix 10.4 and 10.5.

Mueller et al. (1991), divide Europe into the Anglo-Saxon model and the Continental model. The Anglo-Saxon model takes the perspective of a firm's shareholders and focuses on presenting a "true and fair view" (Mueller et al., 1991; Blake and Amat, 1993; Joos and Lang, 1994). Conversely, the Continental model takes the view of the creditors and tax authorities, focusing chiefly on not overvaluing the reported assets of the firm. The Anglo-Saxon (AS) model has traditionally been employed in the UK. At the other extreme, Germany and France have traditionally been firmly committed to the Continental model. Other European countries have historically used accounting standards on a scale in between these countries (Joos and Lang, 1994).

Radebauch et al. (2006), recognizes that some countries in the Continental model have more similarities with the Anglo-Saxon model whereas others have less, and hence splits up the Continental model in Nordic, Latin and Germanic accounting models. The Nordic model, comprised of The Netherlands, Sweden, Denmark, Finland, and Norway, is most in line with the AS model and hence the least conservative. Latin, and to an even greater extent Germanic accounting, is mainly constructed for the benefit of a firm's creditors and the tax authorities. Therefore these models are very conservative and restrictive (Radebauch et al., 2006). Before going into more detail on the specific accounting issues in Europe, we summarize the general differences in Table 1 below.

Table 1. General differences in European accounting

Column [1] represents the Anglo-Saxon model which is used in the UK, and to a lesser extent in The Netherlands. Column 2 represents the Continental model, used in countries such as Germany, France, Italy, Spain, Belgium, Austria, Greece, Sweden, Denmark.

[1] **Anglo-Saxon**	[2] **Continental**
Background	
Common law	Civil law
Large, old, strong accounting profession	Small, young, weak accounting profession
Large stock exchange	Small stock exchange
General accounting features	
True and fair view	Legal view
Shareholder-orientation	Creditor-orientation
Disclosure	Secrecy
Tax rules separate	Tax-dominated
Substance over form	Form over substance
Professional Standards	Government rules
→ Transparant & fair view	**→ Conservative & restrictive**

Source: adapted from Nobes (1992)

Key differences in European accounting rules

For our study, it is most relevant to analyze the accounting rules that actually affect the difference in earnings measures and how they thereby influence multiples. Most of these specific differences result from the main variations in accounting philosophy described above. The issues that most authors identify as having an important impact are differences in reporting of the following:

- Goodwill
- Inventory
- Tangible assets
- Taxes
- Revenue/Cost recognition
- Foreign currency translation
- Research & Development
- Leases
- Pensions
- Provisions & Reserves
- Depreciation

Source: Blake et al. (1993), Nobes (1992), Nobes et al. (2000), Radebauch et al. (2006)

As expected, the UK is the least conservative on the measures above. For example, during our observation period (1995-2006) a UK company is allowed to recognize the revenue of an ongoing project (e.g. construction company, aircraft manufacturer, etc.) based on the percentage

of the process that is completed, and hence has an early revenue recognition. This is called the percentage-of-completion method. A German company, on the other hand, is only allowed to account for the revenue when the entire building process has been completed. For a detailed comparison of the above mentioned factors affecting comparability, see Table A3a and A3b in Appendix 10.6, where we have tried to demonstrate the differences across the clusters (Anglo-Saxon, Nordic, Latin and Germanic). The subsequent section will discuss the necessary adjustments which need to be made for the accounting to become comparable. In order to provide the reader with a better understanding of these adjustments, Table 2 summarizes Nobes' (1991) specific reporting differences concerning the accounting issues described above.

Table 2. Specific differences in European accounting

Column [1] indicates the specific accounting feature that differs between Anglo-Saxon and Continental accounting. Column [2] represents the Anglo-Saxon model which is used in the UK and to a lesser extent in The Netherlands. Column [3] represents the Continental model used in countries such as Germany, France, Italy, Spain, Belgium, Austria, Greece, Sweden, Denmark.

[1] Specific accounting feature	[2] Anglo-Saxon	[3] Continental
Revenue recognition	Percentage of completion method	Completed contract method
Depreciation/Tangible assets	Depreciation over useful lives	Depreciation by tax rules
Reserves	No legal reserves	Legal reserves
Leases	Financial leases capitalised	No lease capitalisation
Reserves	No secret reserves	Secret reserves
Provisions/Taxes	No tax-induced provisions	Tax-induced provisions
Cost recognition	Preliminary expenses expensed	Preliminary expenses capitalisable
Foreign currency translation	Taking gains on unsettled foreign currncy monetary items	Deferring gains on unsettled foreign currency monetary items

Source: adapted from Nobes (1992)

2.3.2 The impact of accounting differences on multiples and how to eliminate these

As mentioned above, the conservative Continental model focuses on not overstating reported profits or assets, in order to protect the interest of creditors or for tax purposes. Since most of the European civil law countries follow these accounting standards, their reported earnings will in general be lower than those of firms in the UK where the Anglo Saxon model is practiced (Joos and Lang, 1994). Higher earnings in the UK will lead to lower P/E multiples for UK firms, holding everything else constant. The higher UK earnings will thus counteract the effect of higher firm values that the "Law and Finance" theory predicts. As a result we cannot be certain that P/E multiples will generally be higher in the UK. We have two opposing effects where the higher firm values should increase the P/E multiples, while at the same time they should be reduced by the higher earnings caused by the accounting system.

Since our analysis focuses on identifying the "Law and Finance" effect present in the numerator, we want to minimize the counteracting effect of accounting. Table A4 in Appendix

10.7 shows the adjustments to the accounting figures that would be necessary to eliminate most of the accounting effect. However, our sample size is too large for such adjustments to be made on a firm-by-firm basis. Instead we use "Earnings Before Interest, Tax, Depreciation and Amortization" (EBITDA), and hence the Enterprise value/EBITDA multiple, as a proxy for adjusted earnings. However, EBITDA is affected by revenue and cost recognition techniques and sometimes by depreciation if it is included in the cost of goods sold (Fridson, 1998). In spite of this, the multiple based on EBITDA eliminates most of the accounting differences that we have outlined above (Koller et al., 2005).

The international financial reporting standards (IFRS) have in recent years aimed at harmonizing the accounting standards of its member states. Note however that the IFRS only became required as of 2005. Since our sample covers the period 1995-2006, the accounting figures that we study are very little affected by this harmonization.

An alternative method of making accounting figures comparable

While using the EV/EBITDA multiple represents one way of controlling for the bulk of cross-country accounting issues, there is an alternative method to achieve this. Previous studies have shown that the level of conservatism in the accounting system only affects earnings when the investments of the firm are growing (Penman, 2004; Feltham and Ohlson, 1995). This result follows trivially from what has been named the "clean surplus relationship". Furthermore, it can be shown that this leads to the conclusion that firms with zero growth have earnings that are unaffected by accounting method.[6] To test if the "Law and Finance" effect holds after controlling for accounting issues we could thus simply restrict our analysis to firms with very little growth. Unfortunately, such firms are quite rare in our sample and in the market in general. We will however attempt to use this alternative method as a robustness check on our results.

→ The main implication for our study is that the P/E multiple is affected by differences in cross-European accounting. We believe that this effect could be big enough to override the "Law and Finance" effect. Since we want to focus our analysis solely on the "Law and Finance" effect present in multiples, we want to control for these accounting effects by using EV/EBITDA.

2.4 THE IMPACT OF "LAW AND FINANCE" ON A PEER GROUP MULTIPLE VALUATION

2.4.1 How Multiple valuation is performed

Multiple valuation works by assuming that the value of one firm can be directly deduced from an identical company (Skogsvik and Skogsvik, 2001). It is therefore a relative valuation technique. The earnings measure provides the basis against which the values of the companies are compared. Thus, the value of a company, P_a, can be determined by combining the value of a peer

[6] We will not prove this relationship here. See a standard textbook such as Penman (2004) for a derivation.

company, P_{peer}, and the respective earnings measure of the two companies, E_a and E_{peer}:

$$P_a = \frac{P_{peer}}{E_{peer}} \cdot E_a \quad (1)$$

This basic approach does not change when several peer companies are used instead of just one.[7] In that case, an average of the peer companies multiples is used.

2.4.2 Details of the valuation model

How suitable peers are chosen

The P/E multiple can intuitively be thought of as a measure of how much an investor is willing to pay for future earnings (Pinkowitz et al., 2006). This intuition makes even more sense if we consider earnings a proxy for cash flow. Established finance theory holds that the value of a firm equals the discounted value of all future cash flows (Koller et al., 2005). If an investor is willing to pay a high amount relative to a firm's current earnings, he must thus logically be expecting higher earnings down the road. The same is true for the EV/EBITDA multiple. Since EBITDA is a better proxy for cash flow than earnings, the intuition holds even better here.

The EV/EBITDA multiple also has the attractive feature that it can be derived from a simple development of the well-known cash flow perpetuity formula. This provides an illustration of how the multiple is driven by the growth in earnings, g, and profitability, ROIC (Koller et al., 2005):[8]

$$EV = \frac{NOPLAT(1 - \frac{g}{ROIC})}{WACC - g} \quad (2)$$

Where EV is the market value of both equity and net debt, and g is the growth rate. ROIC and WACC stand for return on invested capital and cost of capital, respectively. By disaggregating NOPLAT into EBITDA and the company's tax rate (T), we obtain:

$$EV = \frac{EBITDA(1-T)(1 - \frac{g}{ROIC})}{WACC - g} \quad (3)$$

Dividing both sides by EBITDA, we now see that the EV/EBITDA multiple can be stated as:

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[7] Note that P and E can stand for any type of firm price and value driver respectively. Setting P to the market capitalization and the value driver to earnings is the most common approach in practice. However, we show that this is not the only nor always the most appropriate choice.

[8] See Koller et al. (2003) for a derivation of this equation. It originates from the well-known cash flow perpetuity formula: $V = \frac{FCF_{t=1}}{WACC - g}$. By defining cash flow in terms of NOPLAT (Net Operating Profits Less Adjusted Taxes), and the growth rate as g = ROIC·Investment rate, we obtain (2) above.

$$\frac{EV}{EBITDA} = \frac{(1-T)(1-\frac{g}{ROIC})}{WACC-g} \quad (4)$$

This formula shows that besides growth, three other factors drive the multiple: the company's cash tax rate, return on invested capital, and the cost of capital. Generally, these results also hold for the P/E multiple. Given that these factors are what drive multiples, it follows from reason that they also define the criteria for finding comparable companies.

Most analysts look for comparable companies within the same industry as the company they are trying to value. The reason behind this practice is that the average cash tax rate and costs of capital will normally be similar across companies within an industry. However, it is important to note that ROIC and growth can still vary dramatically across firms within some industries (Koller et al., 2005).

Previous studies confirm the importance of looking at growth and profitability rather than industry membership alone (Herrmann and Richter, 2003; Dittmann and Weiner, 2005). In line with this, Cheng and McNamara (2000), find that the best definition of the comparable firms is based on industry membership combined with profitability.

How to aggregate peer companies

After selecting a few comparable companies, their multiples need to be aggregated into a single number that can be used in the valuation. Previous studies do not provide a clear answer on how to do this. The arithmetic mean or the median are the most common methods. However, the arithmetic mean is biased by extreme values and therefore tends to produce inaccurate results (Pratt, Reilly and Schweihs, 2000; Baker and Ruback, 1999; and Herrmann and Richter, 2003).

Baker and Ruback (1999) and Liu, Nissim, and Thomas (2002) argue in favor of the harmonic mean. This measure takes the inverse average of the reciprocals of the numbers.[9] The authors find that the use of the harmonic mean produces the lowest level of estimation errors. Furthermore, they point out that multiples can effectively be thought of as inverse yields. This means that the harmonic mean in effect averages yields. This is an attractive economic feature, because it would give equal weight to equal dollar investments. However, the authors also find that the median works well.

More recent studies such as Herrmann and Richter (2003) question the usefulness of the harmonic mean. Baker and Ruback (1999) remove the 1% highest and lowest observations of their variables. Herrmann and Richter (2003) find that harmonic mean produces skewed results and lower accuracy without this elimination. Moreover, one of Baker and Ruback's (1999) key assumptions is that the reciprocals of multiples are normally distributed. This assumption would

[9] The formula for averaging the figures $a_1, a_2, \ldots, a_N$ can thus be expressed as: $Harmonic mean = \frac{N}{\frac{1}{a_1}+\frac{1}{a_2}+\ldots+\frac{1}{a_N}}$

be sensible if the reciprocal of a multiple was a good measure of the yield on an investment. However, we have not been able to find any evidence of this. Finally, the harmonic mean is hardly ever used in practice (Baker and Ruback, 1999; Huc, interview on 01-02-2007). Since we find that the harmonic mean is a relatively new and unexplored concept in Multiple valuation, we will instead focus on median values in our analysis.

→ The main implication for our study is how we perform the Multiple valuation. We have shown that the peer group should be made up of companies with similar growth and profitability, and that the median should be used to aggregate their multiples.

2.5 SUMMARY OF THEORETICAL FRAMEWORK & PREVIOUS FINDINGS

- The theory of "Law and Finance" holds that greater minority shareholder protection leads to a higher level of financial development, and ultimately higher valued firms in the market. Therefore, firms are priced higher in the UK.
- Substantial criticism has been leveled against the field of "Law and Finance". In particular, other studies question if minority shareholder protection affects firm values.
- Earnings multiples are constructed as ratios of firm value and an earnings measure.
- "Law and Finance" theory predicts that multiples will be higher in the UK.
- Anglo-Saxon accounting is generally less conservative than Continental accounting, which leads to higher earnings in the UK.
- To isolate the "Law and Finance" effect on multiples, we need to compare the EV/EBITDA multiple, which takes out most accounting differences.

3 HYPOTHESES

Table 3 below summarizes our research questions as well as the corresponding hypotheses.

Table 3. From Research Question to Hypothesis

This table provides an overview of our three research questoins and the corresponding hypotheses we test for. The three questons are marked by Q1-Q3 and the subsequent hypotheses by H1-H4.

Q1:	**Is there a "Law and Finance" effect on multiples that *DO NOT* adjust for accounting differences?**
H_1:	*P/E multiples in the UK are higher than in the rest of Europe, as predicted by "Law and Finance" theory.*
Q2:	**Is there a "Law and Finance" effect on multiples that *DO* adjust for accounting differences?**
H_2:	*EV/EBITDA multiples, which controls for most accounting differences, are higher in the UK than in the rest of Europe, as predicted by the "Law and Finance" theory.*
H_3:	*After controlling for accounting differences, the higher multiples in the UK are driven by a more rigorous legal protection of minority shareholders.*
Q3:	**Can we also observe a "Law and Finance" effect on a cross-European Multiple valuation?**
H_4:	*A cross-European Multiple valuation is affected by higher UK earnings multiples.*

3.1 IS THERE A "LAW AND FINANCE" EFFECT ON MULTIPLES THAT DO NOT ADJUST FOR ACCOUNTING DIFFERENCES?

As demonstrated above, the theory of "Law and Finance" holds that the legal origin of the UK causes that country to offer minority shareholders a corporate governance setting that generally protects their interests better than in other European countries. While the UK is at one extreme on this scale, Germany and France are at the other extreme, with the Nordic countries falling somewhere in the middle. In line with LLSV (2002) we thus expect that the institutional setting causes earnings multiples to be higher in the UK. We want to test if this effect can be observed using the P/E multiple, i.e. if LLSV's (2002) findings can be replicated with this multiple:

H_1: P/E multiples in the UK are higher than in the rest of Europe, as predicted by "Law and Finance" theory.

3.2 IS THERE A "LAW AND FINANCE" EFFECT ON MULTIPLES THAT DO ADJUST FOR ACCOUNTING DIFFERENCES?

Our discussion of the major accounting clusters in Europe shows that even if performances of a UK and a continental European firm are identical, the UK firm will generally report higher earnings. This is because the AS model has been constructed to provide investors with a "true and fair view". On the other hand, the Continental model is much more focused on providing conservative reporting. We thus see that the higher equity prices predicted by "Law and Finance" theory should be counteracted by an accounting effect. Our previous discussion shows that most of this accounting effect should disappear when EBITDA is used instead of earnings. This will allow us to test if we need to control for accounting differences to see the "Law and Finance" effect:

H_2: EV/EBITDA multiples, which controls for most accounting differences, are higher in the UK than in the rest of Europe, as predicted by the "Law and Finance" theory.

3.3 AFTER ELIMINATING ACCOUNTING DIFFERENCES, ARE HIGHER MULTIPLES IN THE UK DRIVEN BY A "LAW AND FINANCE" EFFECT?

By testing these two hypotheses, we will see if the impact of different accounting traditions is large enough to overshadow the "Law and Finance" effect. However, this alone will not show whether the multiples are higher because of better legal protection of minority shareholders, i.e. the "Law and Finance" effect. To investigate this, we must examine if there is a correlation between the level of minority protection and firm values.

As our literary review on the field of "Law and Finance" shows, many studies criticize the notion that higher minority protection drives financial development and firm values. Because of the criticism against LLSV (1997, 1998 and 2002), we want to examine if their findings are actually driven by a higher level of minority shareholder protection in the UK. This will assure that the higher multiples we find for the UK are not driven by some other factor such as history, political factors, geography, etc. By controlling for accounting differences, the effect should be more isolated than in the study by LLSV (2002).

H_3: After controlling for accounting differences, the higher multiples in the UK are driven by a more rigorous legal protection of minority shareholders.

3.4 CAN WE ALSO OBSERVE A "LAW AND FINANCE" EFFECT ON A CROSS-EUROPEAN MULTIPLE VALUATION?

Once we find evidence that there is a "Law and Finance" effect on earnings multiples, and that it seems to be dependent on shareholder protection, we want to examine its impact on a peer group valuation based on these multiples. In other words, our analysis will examine whether someone trying to value a UK firm can include companies from the rest of Europe in the peer group, or if it is necessary to only use comparable companies from the same country. Even if we find that UK earnings multiples are higher, we cannot immediately conclude that Multiple valuation using a peer group is affected. This results from the fact that a peer group comprises of firms from both the UK and the rest of Europe. Hence averaging their multiples will smoothen out any "Law and Finance" effect.

H_4: A cross-European Multiple valuation is affected by higher UK earnings multiples.

4 DATA

Appendix 10.2 summarizes the descriptive statistics for our sample data. All of our data was automatically collected from Thomson Financial's database Datastream by means of a programmed spreadsheet. The spreadsheet we constructed collects yearly data from all firms included in the Dow Jones STOXX TMI index over the period 1995-2006. We opted for the DJ TMI STOXX index since it constantly adapts to include only those firms that together represent 95% of the market capitalization on the European exchanges. See Table A7 in Appendix 10.10 for a list of the European countries from which firms are included. By excluding the bottom 5% market capitalization firms, we can avoid most of the biases associated with the lower liquidity of smaller companies (LLSV, 2002).

Overall, our database consists of 1026 companies, which are split up into 18 industries by means of the Industry Classification Benchmark (ICB) supersectors. Besides being used by other authors such as Schreiner and Spremann (2007), the ICB is a classification system developed by Dow Jones and FTSE, and is used by NASDAQ as well as several other international markets. Since our statistical technique is dependent on the firm-specific differences being constant (fixed effects), we decided to only study data covering the relatively short period 1995-2006. For the 1026 companies, over the 12 years, we collected the following 2-year forward-looking analyst's estimates: earnings, EBITDA, EBT, ROIC and growth.

Given the ambiguity of some data-type definitions in the Datastream database, we have compared the figures to statistics from Orbis, another financial data provider. In order to validate the accuracy of the data, we also made manual checks by looking at the annual reports of a small number of companies. Even though the results of both checks were satisfactory, it is important to be aware of the inherent errors that may be included in data that is retrieved from large databases. Moreover, by controlling the data we found certain errors that needed correction. The single most important correction was the adjustment of observations of Greek firms over the years 1995-1998. Whereas all other observations are noted in millions, Datastream presents the Greek figures in thousands.

Furthermore, linked to the spreadsheet where the Datastream figures can be collected automatically, we programmed a spreadsheet that calculates our multiples and also produces valuations based on these for every firm and year. It presents the results in a manner suitable for statistical programs such as Stata. Before being able to calculate the multiples, one has to specify the industry to be studied. The Excel sheet will allow anyone to replicate and update our results. In order for others do to so, we have made the program available online at "http://web.comhem.se/monegard".[10]

[10] Please be advised that the program can run for several hours once initiated, depending on computation power, and that your PC may become unresponsive during this time. Instructions are included in the file.

5 METHODOLOGY

We present each hypothesis and the corresponding testing methodology separately. In order to discuss how a Multiple valuation is best performed, especially considering the few academic studies in this area, we have conducted three interviews with valuation specialists from the McKinsey & Company Amsterdam office.[11] *Fortunately, we were able to interview experts with different industry specializations.*

We eliminate industries in which Multiple valuation does not provide accurate results without extensive firm-by-firm adjustments. This is to ensure that our Multiple valuation model produces accurate results. As we show below, out if the original 18 industries only 5 are interesting to look at. These 5 industries are: *Basic Resources*, *Chemicals*, *Food & Beverage*, *Industrial Goods & Services excluding Aerospace & Defense* and *Media*. The analyses will focus on these main industries.

5.1 THE IMPACT OF "LAW AND FINANCE" ON MULTIPLES THAT DO NOT ADJUST FOR ACCOUNTING DIFFERENCES

This section explains how we test our first hypothesis. This means testing if earnings multiples are higher in the UK. To achieve this, we simply compare the median P/E multiples in the UK to the median P/E multiples in the rest of Europe. In order to see if the UK multiples are significantly higher from a statistical standpoint, we employ a non-parametric equality of medians test.

5.2 THE IMPACT OF "LAW AND FINANCE" ON MULTIPLES THAT DO ADJUST FOR ACCOUNTING DIFFERENCES

To test our second hypothesis, we employ the same test as when analyzing hypothesis 1. However, this time we employ a multiple that eliminates most of the accounting differences between countries. As we have shown, the EV/EBITDA multiple does this. We thus use a non-parametric equality of medians test to evaluate if the median EV/EBITDA is significantly higher in the UK than in the rest of Europe.

5.3 AFTER ELIMINATING ACCOUNTING DIFFERENCES, ARE HIGHER MULTIPLES IN THE UK DRIVEN BY A "LAW AND FINANCE" EFFECT?

This section explains how we test for our third hypothesis. Considering the substantial criticism against LLSV (1997, 1998 and 2002) we want to examine if multiples are actually higher because

[11] See our reference list for names and dates.

of a "Law and Finance" effect. In other words, we want to examine if the higher multiples are *driven* by higher minority shareholder protection. To examine this we investigate if a higher minority shareholder protection measure is correlated with higher multiples. A straightforward way of doing this is to regress the EV/EBITDA multiple of a firm against the level of minority protection of the country that it is in. We use LLSV's (1997) anti-director rights index to measure the level of minority protection. Thus, we perform the following regression for all firms (over all years):

$$EV_i / EBITDA_i = \alpha + \beta \cdot Anti\text{-}director\ rights_i + \varepsilon_i \quad (5)$$

Where i = firm 1, firm 2, …, firm N

We use an Ordinary Least Squares (OLS) regression to analyse our data: If the coefficient of this regression is positive and statistically significant, we find evidence that higher shareholder protection leads to higher earnings multiples.

5.4 CAN WE ALSO OBSERVE A "LAW AND FINANCE" EFFECT ON A CROSS-EUROPEAN MULTIPLE VALUATION?

This section of the methodology explains how we test for the fourth and final hypothesis. First we explain how we perform Multiple valuations. Second, we describe why Multiple valuation only works well for five industries. Finally, we explain how we test hypothesis 4 using these five industries.

5.4.1 How we perform the Multiple valuation

Simply put, our valuation model is constructed as we explained above in section 2.4.1. The only difference is that we now use a median of the peer group's multiples:

$$P_a = Median\left(\frac{P_{peer}}{E_{peer}}\right) \cdot E_a \quad (6)$$

This simple model omits three important facts. First, a Multiple valuation is performed using forward-looking earnings estimates. We want our model to show this fact. Second, we want to use our model to value firms using other multiples than only the P/E multiple. Finally, we want the model to show that we can value any of our firms in any particular year. We thus rewrite our model more formally to include these facts. However, it is important to note that it still shows the same simple valuation technique as equation (6), only expressed more precisely.

$$ModelValue_i^t = Median\left(Mult._j^t, Mult._{j+1}^t, ..., Mult._{N-1}^t, Mult._N^t\right) \cdot \tilde{E}^{t+2}\left[Earningsmeasure_i\right] \quad (7)$$

where $Mult._j^t = \dfrac{FirmValue_j^t}{\tilde{E}^{t+2}\left[Earningsmeasure_j\right]}$

- $i \neq j$ and t = year 1995, …, year 2006
- $Mult._j^t$ stands for the multiple of company j in year t
- N is the total number of peer firms
- $\tilde{E}^{t+2}\left[Earningsmeasure_i\right]$ stands for the two-year forward-looking earnings measure estimate of the for firm i (earnings measure can be earnings, EBT or EBITDA)
- $FirmValue_j^t$ stands for the market value of firm j in year t

We perform these valuations using both the P/E and the EV/EBITDA example.[12] We have also decided to do the analysis using a P/EBT (price-to-earnings before taxes) multiple, in order to see how differences in tax rates are influencing our results. We use this Multiple valuation model to value each firm every year. Since we already know what the firms were actually worth in the market at the time, we can use a regression framework to investigate how the model value relates to the actual value. Again, note that we include firms both from the UK and from other European countries as part of the peer group.[13]

[12] It is important to notice that we have excluded the multiple of the company that we are trying to value in the sample ($i \neq j$). This is important for the realism of the model. One would never include the multiple of the company being valued when aggregating the multiples of a peer group. Also, in many real life situations where multiples are useful, the multiple of the firm being studied may not be possible to calculate. For example, this is the case with initial public offerings, IPOs.

[13] In fact, considering the small number of firms present on the LSE for some industries, an analyst would have to look beyond the UK to find comparable companies. However, there is no reason to believe that he would not also try to include any comparables actually available from the UK market.

5.4.2 Choice of industries

Table 4 below presents a summary of the criteria we use to exclude industries from our sample as well as which industries are excluded.

Table 4. Industry Selection

This table provides an overview of why we excluded certain industries from our analysis. Column [1] presents the specific criterias on which we decided to eliminate. Column [2] are the industries that have been eliminated.

[1] **Elimination criteria**	[2] **Eliminated industries**
Because of further split up	Personal and Household goods
	Health care
	Industrial Goods and Services
	Financial Services
Growth discrepancies	Health care *only Equipment & Services*
	Health care *only Pharmaceutical & Bio*
	Technology
ROIC discrepancies	Travel and Leisure
Accounting discrepancies	Utilities
	Banks
	Insurance
Too few UK firms	Automobil and Parts
	Construction and materials
Low goodness-of-fit (R^2)	Telecom
	Financial Services *only Real Estate*
	Financial Services *only General Finance*
	Retail
Driven by tax issues	Oil and Gas Industry
	Personal & Hh goods *excl. Tobacco*

The following section will elaborate on why we limit the number of industries we mainly analyze to five. We will explain why Multiple valuation only provides accurate results when certain criteria are met.

Rather than a manual approach we have chosen to standardize the industry classification of our firms according the ICB classification. This is necessary given the considerable number of companies in our database. Furthermore, this is in line with the methodology employed in previous studies, such as Schreiner and Spremann, (2007). To make our firm groups as homogenous as possible, we use a two-digit ICB classification, i.e. "supersectors". While we would like to look at the narrower three-digit classification "sectors" there simply are not enough firms in each for our statistical investigation to produce reliable results. See Table A5 in Appendix 10.8 for an overview of the supersectors in our sample, and the sectors that they group together.

Supersectors

A quick glance at the composition of the supersectors in Table A5 Appendix 10.8 reveals some disturbing issues. Some of the supersectors seem to be made up of companies with very different attributes. For example, we see that the *Personal and Household Goods* supersector includes the sector *Tobacco*. However, we do not want to include a company such as British American Tobacco in order to value a more typical *Personal and Household Goods* company such as L'Oreal. For this reason we remove *Tobacco* from this group. This is also a means of making sure that the companies we group together do not differ substantially in terms of growth, ROIC, tax and cost of capital, in line with our earlier discussion on suitable peer companies. Similarly, we have chosen to split up the supersector *Healthcare* into its two sectors *Healthcare Equipment and Services* and *Pharmaceuticals and Biotechnology*. This is mainly because we believe these sectors have very different growth rates. Furthermore, we have taken out the sector *Aerospace and Defense* from the supersector *Industrial Goods and Services*. This is because we believe that the growth and profitability of this sector, unlike the other *Industrial Goods and Services* sectors, is mainly driven by political forces, rather than a market mechanism. Finally, we split up the *Financial Services* supersector into the two sectors *General Financial* and *Real Estate*. Not only do these two sectors operate in completely different institutional settings, but we also believe them to have quite different capital intensity and financial risk. A study of the subsectors included in the supersector *Travel and Leisure* reveals a disturbing result. *Gambling, Airlines, Hotels* and *Restaurants* are a few of the subsectors grouped together here. Since we do not believe that these widely different industries are comparable, we have decided to exclude the *Travel and Leisure* supersector from our sample.

ROIC and Growth

As we showed above, firms within the same industry are often assumed to have roughly similar tax rates and cost of capital (Koller et al., 2005). However, our theoretical background shows that finding peer firms with similar ROIC and growth is more elusive. Even if we follow the approach of Alford (1992) and subdivide our industries into supersectors, we cannot be sure that these companies have the same level of ROIC and growth. Our results show that the problem seems more pronounced in some sectors than others. See Table A6 in Appendix 10.9 for a summary of descriptive statistics on the ROIC and growth of our studied sectors. Since we have opted for a methodology where we choose peer companies automatically from the same supersector as the firm being valued, rather than a manual peer group selection, this problem could potentially distort our results (Herrmann and Richter, 2003; Dittmann and Weiner, 2005; Cheng and McNamara, 2000). To decrease this risk, we will exclude the most problematic sectors from our analysis. These sectors are: *Health care only Equipment & Services, Health care only Pharmaceutical & Bio., Retail, Technology,* and *Travel and Leisure.*

Accounting issues in some of the industries

Valuation practitioners generally do not compare *Utilities* companies across Europe without making individual firm adjustments. (Huc, interview on 01-02-2007). This is because of heterogeneity in accounting figures resulting from a different view of provisions throughout Europe. To avoid such problems in our results, we have excluded these firms from our analysis. While we believe that corrections could be made that enable a direct comparison between these companies, we believe that such an exercise is beyond the scope of this paper.

Due to heavy regulation and accounting rules for the *Banks* and *Insurance* industry, several studies exclude these industries form their data sample (King and Langli, 1998; LLSV, 2002). For our study, the principal problems with these firms stem from the difficulties in measuring the value of their net debt. In particular, it is problematic to determine what parts of the liabilities should be considered as operational (Koller et al., 2005; Olthof, interview on 20-02-2007). This makes it troublesome to determine an appropriate EBITDA measure.[14]

Industries with too few observations

In general, the London Stock Exchange (LSE) is home to a significantly higher number of firms than any other exchange in Europe.[15] However, for a few of our sectors, there are surprisingly few firms listed on the LSE. This is because of a general pattern in our data, namely that the different stock exchanges in Europe are heavy in different sectors. For example, while the Oslo Stock Exchange is heavy in *Oil and Gas*, the LSE is home to many *Financial Services* companies. Considering that we have a limited number of forward-looking earnings estimates from the beginning of the period that we examine, this raises a problem for our analysis. Logically, we do not want to include any sectors where there are no or very few firms listed on the LSE for a majority of the years. This would not produce statistically reliable results. We therefore set the minimum number of UK firms to 6.[16] This leads us to exclude two sectors from our sample, *Automobiles and Parts* and *Constructions and Materials*.

Industries where our analysis produces a low goodness-of-fit (R^2)

We will show that while the goodness-of-fit (R^2) measures of our regressions are generally high, they are disappointingly low for some industries. In particular it seems that our valuation model produces quite high errors when valuing companies from *Telecom*, *Financial Services-only Real Estate* and *Financial Services-only General Finance* and the *Retail* industry.

[14] See Morgan (1999) for a discussion on the difficulties of valuing the net debt of banks and how this relates to the heavy regulatory system governing this industry.

[15] As an illustration of this, 297 of the 1026 in the Dow Jones TMI index are listed on the LSE. As a comparison, only 106 of the firms are listed on the Paris Bourse.

[16] This is in line with the study by Baker and Ruback (1999), who arbitrarily limit their minimum number of firms to 7.

Industries where firm difference seem driven by tax issues

As we show below in section 6.4.4 of our analysis, the results for the *Oil and Gas* and *Personal and Household goods-excluding Tobacco* are not robust when taxes are considered. It thus appears that the cross-country differences are driven by discrepancies in tax rates. Consequently, the results produced by these industries are difficult to analyze unless we specifically examine the tax situation in these sectors. Since we do not go deeper into the vast field of international tax differences in this paper, we will leave these industries for future studies to examine in more detail.

→After all the above considerations, the sectors we want to focus on are: *Basic Resources, Chemicals, Food and Beverage, Industrial Goods and Services-excluding Aerospace & Defense* and *Media.*

5.4.3 Model and regression equations

Above we have defined the Multiple valuation model and what industries it works for. We can use this valuation model, illustrated in equation (7), to value any of our firms (in any year). Once we do this, we want to compare the valuations that this model produces with the actual market values of the firms. The most straightforward way to achieve this is simply to regress the market value against the model value that we get from the Multiple valuation. This will produce a measure of the relationship between the model value and the actual market value:

$$Marketvalue = \alpha + \beta \cdot Modelvalue + \varepsilon \qquad (8)$$

The result from such a regression is threefold. First, we see how well the model values fit with the actual market values of the firm. Second, we can ascertain whether there is a significant positive relationship between the value produced by the model and the market value, i.e. if β is positive and significant. Naturally, we hope to see a 1 to 1 relationship here. The intercept term will capture how much, on average, the market value of a firm is when the model gives a value of zero. We know that the Multiple valuation gives a zero value when the earnings measure of the firm is zero (see equation 7). Logically, we expect firms to be worth something even in the years when their earnings are zero. Therefore we expect the intercept to be significant and positive.

The dummy variable

We want to test whether the higher UK multiples have significant impact on Multiple valuation. This is of course equivalent to testing if lower multiples in the rest of Europe have an effect on the valuation. As equation (7) shows, lower multiples in the peer group means that the valuation model will give lower results. If European firms are included in the peer group, and they have much lower multiples than the UK firms, then the model will give lower results. Logically, the valuation will then undervalue UK firms. We test this by including two dummy variables in the regression model.

$$Marketvalue_i = \alpha_1 + \alpha_2 \cdot Dummy_i + Modelvalue_i + \beta_2 \cdot Modelvalue_i \cdot Dummy_i + \varepsilon_i \quad (9)$$

The variable *Dummy* takes on the value 1 if the company is in the UK, and 0 otherwise.

OLS regression

The simplest way to analyze the data is to "pool" all observations and perform an Ordinary Least Squares, OLS regression. We here disregard the fact that each observation has a firm dimension, *i*, and a time dimension, *t*. Thus we do not distinguish between years or companies, but instead treat every observation identically.

We perform the analysis separately for each industry. Within each industry we perform the regressions for each multiple analyzed. To express that our model value depends on what multiple we use, we can rewrite the regression equation as:

$$Marketvalue_i = \alpha_1 + \alpha_2 \cdot Dummy_i + \beta_1 \cdot Modelvalue_i(Mult.) + \beta_2 \cdot Modelvalue_i(Mult.) \cdot Dummy_i + \varepsilon_i \quad (10)$$

Where *Mult.* can stand for any of the multiples that we use in the valuation model. The two dummy variables measure the two ways in which the model can undervalue UK firms. First, the level between the UK and the rest of Europe can be different. Therefore the first dummy variable in equation (10) measures how much the level changes when valuing firms in the UK, i.e. how much lower the intercept is. Second, the slope can be different.[17] The second dummy variable in equation (10), $Modelvalue_i(Mult.) \cdot Dummy_i$, measures if this is the case. If either of the dummy variables is significant, we have an indication that the valuation model undervalues firms in the UK. Note that we will refer to these variables as the intercept dummy and the slope dummy respectively.

Panel data regression

Because of the nature of our data, we have two dimensions or *panels* for our observations, i.e. time and firm. As a means of taking this into account, we will perform a panel data regression analysis as an alternative to the slightly simplistic pooled OLS approach.

Fixed effect regression (Least Squares Dummy Variable regression)

The problem with the OLS regression is that it does not take into consideration the individual differences between firms. These could be caused by different taxes, quality of management, growth prospects or any other factors that effect company value. Since our companies are likely to differ considerably in these respects, we need to control for such firm-specific differences. If we assume that these do not change significantly over the years that we study, there is a panel

[17] The slope is the linear relationship between model and market value.

data regression method designed specifically to control for such differences (Gujurati, 2003). This is called the panel data fixed effect regression. Basically, it takes into account that each observation has both a time and a firm dimension, and introduces a separate intercept dummy for each firm. Therefore it is sometimes referred to as a Least Squares Dummy Variable (LSDV) regression. The model equation can be stated as:

$$Marketcap_i^t = \alpha + \beta_1 \cdot Modelvalue_i^t + \beta_2 \cdot Modelvalue_i^t \cdot Dummy_i^t + \\ + \lambda_2 D_{2i} + \lambda_3 D_{3i} + ... + \lambda_N D_{Ni} + \varepsilon_{it} \quad (11)$$

- The dummies $\lambda_2 D_{2i} + \lambda_3 D_{3i} + ... + \lambda_N D_{Ni}$ are only included as a technical means of controlling for the firm-specific differences. Every one of these dummies measures how much the individual characteristics of a particular firm cause it to increase or decrease in value.
- *t* stands for year and varies from 1995 to 2006.
- *i* stands for firm, and varies from firm 1 to firm *N*.
- The $Modelvalue_i^t \cdot Dummy_i^t$ variable measures if the Multiple valuation model systematically undervalues UK firms, because of the lower multiples of other European firms included in the peer group.

The model is very similar to the OLS regression. The crucial difference is that the firm-specific differences are taken into consideration. By controlling for these differences in this manner, the "Law and Finance" effect on the valuation results will be better isolated.[18] However, because of the large number of dummy variables included, it can be shown that it is technically not possible to also include the intercept dummy that we used above (Gujurati, 2003). A drawback of this model is thus that it assumes equal intercepts for the UK and for the other European firms. Fortunately, as we show below, we find that this assumption is quite reasonable for our data. This is because the slope dummy captures most of the difference between valuation of UK and other European firms.

Random effects regression (GLS regression)

An alternative statistical approach would be to let the firm-specific differences to vary over time. The random effects model, also called Generalized Least Squares (GLS), is one method of doing just that. Unfortunately, as we show below, this method is unsuitable for our data both from a

[18] Gujurati (2003) also finds that this kind of analysis produces "more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency" and prevents possible bias that might otherwise result from grouping firms into broad aggregates.

logical and from a purely numerical viewpoint. See appendix 10.22 for a more technical description of the GLS approach.

5.5 SUMMARY OF THE METHODOLOGY

- A number of industry selection criteria are considered to ensure that our valuations are as accurate as possible, and in line with what is used in practice: ROIC and growth, accounting issues, minimum number of observations, goodness-of-fit and tax issues.
- In total we will focus on five industries.
- We test if the medians are higher in the UK with a non-parametric test
- We regress medians multiples against an index of shareholder protection to see if there is a positive relationship.
- We regress the model values of our Multiple valuation model against the actual market values of the firms, and test if the results are very different between the UK and the rest of Europe.

6 RESULTS AND DISCUSSION

Below we present and discuss our empirical findings. Each hypothesis is analyzed separately.

6.1 THE IMPACT OF "LAW AND FINANCE" ON MULTIPLES THAT DO NOT ADJUST FOR ACCOUNTING DIFFERENCES

Here we will evaluate whether our empirical findings supports our first hypothesis:

H_1: P/E multiples in the UK are higher than in the rest of Europe, as predicted by "Law and Finance" theory.

We test if the median P/E multiple is higher in the UK than in the rest of Europe. As we explain in the preceding section, we will focus our analysis on five particular industries. Note that we perform our tests at 5% level of significance throughout the paper.

6.1.1 Comparison of P/E multiples between the UK and the rest of Europe

We do not find any clear evidence that P/E multiples are higher in the UK. Our findings are summarized in Table A8 in Appendix 10.11. In this table, we see that the nonparametric equality-of-medians test shows that the differences in medians between the UK and the rest of Europe are insignificant in three out of our five industries. The other two industries show results that contradict each other. In one industry the median P/E in the UK is higher, while the median P/E in the rest of Europe is higher in the other.

However, these results do not provide evidence that there is no "Law and Finance" effect on earnings multiples. Our opinion is that it may rather be an effect of accounting biases on the P/E multiple. As we show in section 2.3.2, the P/E multiple denominator is likely to be impacted by an array of accounting biases. These discrepancies generally act in the opposite direction of the "Law and Finance" effect. Therefore it is not possible to determine a priori which of the two effects is stronger. In other words, we don't know if the results show that there is no "Law and Finance" effect, or if it is simply overshadowed by difference in accounting traditions.

→ In summary, our findings do not support hypothesis 1, hence we reject it.

6.2 THE IMPACT OF "LAW AND FINANCE" ON MULTIPLES THAT DO ADJUST FOR ACCOUNTING DIFFERENCES

Here we will examine if our data supports our second hypothesis:

H_2: EV/EBITDA multiples, which controls for most accounting differences, are higher in the UK than in the rest of Europe, as predicted by the "Law and Finance" theory.

To achieve this, we compare if the median EV/EBITDA multiple is higher in the UK than in the rest of Europe. As we have shown, the EV/EBITDA multiple controls for most accounting biases.

6.2.1 Comparison of EV/EBITDA multiples between the UK and the rest of Europe

Our data supports the hypothesis that earnings multiples are higher in the UK, once we control for accounting issues. Our results are summarized in Table A9 in Appendix 10.12. They clearly show that the EV/EBITDA multiple is generally higher in the UK than in the rest of Europe. The 5% nonparametric equality-of-medians test shows that the UK multiple was statistically higher in four out of five industries. At 10 % level of significance it was statistically higher for the UK in all five industries. Intuitively, it seems that investors are pricing cash flows from UK firms higher than from firms in other countries. However we still need to test whether this is, in fact, a "Law and Finance" effect.

→ In summary, since our results do support hypothesis 2, we do not reject it.

6.3 AFTER ELIMINATING ACCOUNTING DIFFERENCES, ARE HIGHER MULTIPLES IN THE UK DRIVEN BY A "LAW AND FINANCE" EFFECT?

Here we will discuss our third hypothesis:

H_3: After controlling for accounting differences, the higher multiples in the UK are driven by a more rigorous legal protection of minority shareholders.

To test this hypothesis, we regress the LLSV (1997) index of minority shareholder protection against EV/EBITDA. As mentioned, we have chosen to analyze all our data on a 5% significance level, so that the results will be comparable throughout our analysis. The degrees of freedom of our tests range between 111 and 857. This means that the critical t-value against which we analyze our results ranges between 1.98 and 1.96. We round this up to 2.0 to be on the safe side, and reject our null hypothesis in the cases where the observed t-values exceed this number.

6.3.1 The relationship between EV/EBITDA and investor protection

Our findings show that higher earnings multiples indeed seem to be driven by the level of minority protection. Table 5 below summarizes our regression results.

Table 5. OLS regression including LLSV (1997) "anti-director" index

This table provides the results of an OLS regression for our 5 main industries. The result show the coefficients for the multiples when regressed against LLSVs (1997) "anti-director" index. t-values are shown in the parentheses. The coefficients that are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".

	EV/EBITDA	
	[1]	[2]
	Anti-director rights	**t-value**
Basic resources	0.853***	(5.32)
Chemicals	0.234**	(2.39)
Food & Beverage	0.306**	(2.42)
Industrial G & S *excl. Aero. & Def.*	0.235**	(2.51)
Media	0.668***	(2.89)

Our results indicate a significant positive relationship between the LLSV (1997) anti-director rights and EV/EBITDA for all five industries. This shows that there is a statistically significant, positive relationship between firm value and shareholder protection of the country in which it is listed. The results of our earnings multiple analysis are thus in line with the findings by LLSV (2002), as long as we control for accounting differences between countries. In other words, investors seem to be pricing the cash flows of firms in countries with better shareholder protection higher than for similar companies in other countries. This is in line with the theory that investors are pricing in the probability that cash flows generated will eventually reach them into the market value of a company. Therefore earnings multiples are lower in countries where there is a high risk of being exploited by a controlling shareholder.

6.3.2 LSDV analysis of the relationship between anti-director rights and multiples

We are not able to perform a LSDV regression analysis on the relationship between the anti-director rights and multiples. On a technical note, this is because the fixed effects estimator removes all firm-specific values that are constant over our examined period. Since very few firms in our sample re-list on an exchange in a different country, the anti-director rights for any given firm generally remain constant during our studied period.

➔ ***In summary, our results support hypothesis 3 and hence we do not reject it.***

6.4 CAN WE ALSO OBSERVE A "LAW AND FINANCE" EFFECT ON A CROSS-EUROPEAN MULTIPLE VALUATION?

As we have shown above, multiples are significantly higher in the UK once we control for accounting differences. While this result is in itself very interesting, we here want to take one step further and examine whether this has an impact on Multiple valuation. However, we also include the P/E multiple for comparison.

H_4: A cross-European Multiple valuation is affected by higher UK earnings multiples.

As we explain in the methodology, we test this hypothesis by regressing the values produced by the valuation model against actual market values. The degrees of freedom of our tests here range between 122 and 1558. This means that the critical t-value against which we test our coefficients ranges between 1.98 and 1.96 at a 5% level of significance. Again, we round this up to 2.0 to be on the safe side, and find the coefficients statistically significant in the cases where the observed t-values exceed this number.

6.4.1 OLS regression results

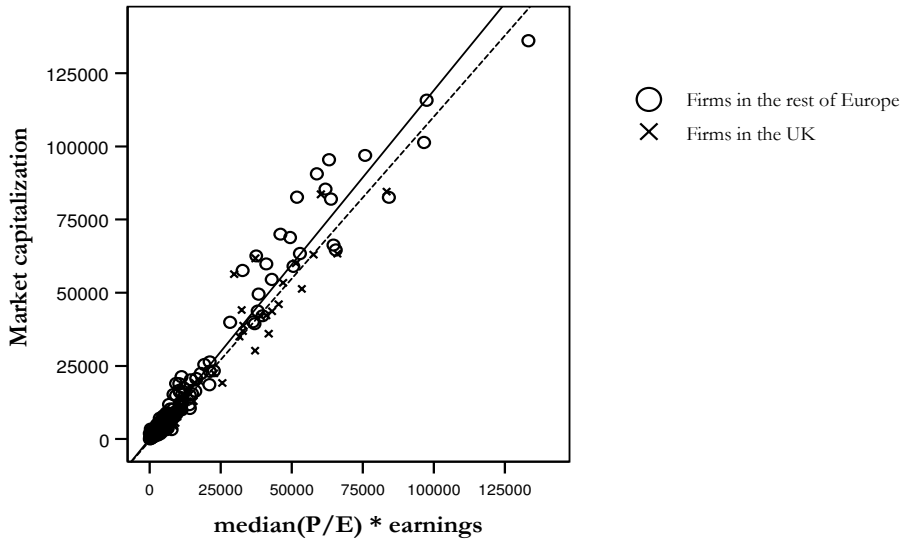
First, we note that the Multiple valuation model works quite well. See Table A10 in Appendix 10.13 for the regression results for the five industries on which we focus our analysis. In every one of our regressions there is a highly significant, positive relationship between model value and market value. This is indicated by the high t-values of the model value variable. Furthermore, we see that the goodness-of-fit (R^2) is quite high. On average it was 87%.

Our OLS regression results do not show any general pattern to explain how the higher UK earnings multiples are affecting Multiple valuation. As we explain above, since multiples are significantly lower in the rest of Europe the model is expected to undervalue UK firms. In other words, the valuation model should produce significantly different results between the UK and the rest of Europe. Instead our results are mixed.

As we explain in section 5.4.3, we judge whether the Multiple valuation technique produces different results between the UK and the rest of Europe by studying the coefficients of the dummy variables. In the cases where we find that the coefficients of the intercept- or slope dummy variable are statistically different from zero, we say that the model does not produce comparable results.

As an example, consider the P/E Multiple valuation in the *Food and Beverage* industry. Our regression results in Table A10 in Appendix 10.13 show that the slope dummy in this industry has a t-value of -2.64. Since the absolute number of this figure is larger than our critical t-value of 2.0, we say that the slope dummy is statistically significant. This means that the valuation model produces significantly different results in the UK than in the rest of Europe. It thus seems that the lower multiples in the rest of Europe have a significant impact on the Multiple valuation in this case. We show this graphically in figure 1 below.

Figure 1. Regression fit for OLS regression (Food and Beverage, P/E-multiple valuation)



Million USD. Note that the dotted line shows the regression fit for firms in the UK.

The dotted line shows the regression line through the UK observations. The other line shows the regression line trough the observations for the rest of Europe. A significant slope dummy shows that the difference in slope between these two lines is large.[19] Note that the intercept dummy does not capture much of the difference, i.e. the difference in levels is not large.

To make it easier to read out any patterns, we have summarized when the regression results indicate that the Multiple valuation produces comparable results and when it does not. See Table A11 in Appendix 10.14 for these results. The table is more straightforward than the raw regression results. If the table indicates "YES", this means that the model produces comparable results for that industry. This means that the differences in multiples are not causing the Multiple valuation to significantly undervalue UK firms. Simply put, this tells us that an analyst could include European companies to form the peer group, without causing the Multiple valuation model to undervalue UK firms by a significant amount. For the reader interested in seeing the results for the other industries than the five that we have focused on here, these findings are summarized in Table A12 in Appendix 10.15.[20]

6.4.2 Error sources in the OLS regression

As we explain above, the biggest problem with the OLS approach is that is does not control for firm-specific differences. Apart from this, there are two main sources of error that may distort

[19] To find the resulting slope coefficient for the regression containing only UK firms, simply add the coefficient for the other European firms and the slope dummy coefficient, $\beta_1+\beta_2$. As an example, the slope coefficient for UK firms illustrated in figure 1 is found by adding, $\beta_1 = 1.19$ and the slope dummy coefficient, $\beta_2 = -0.08$ leading to a coefficient of 1.11.

[20] In order to fit these results into one table, we have chosen to only present the statistical significance of the dummy coefficients and the goodness-of-fit of the regression.

our OLS regression results, i.e. autocorrelation and multicollinearity. In short, autocorrelation occurs because the error terms, ε_i in equation (10), are not independent. This violates one of the critical assumptions underlying the OLS regression. See Appendix 10.16 for a complete list of the assumptions we must make in order to use the OLS regression.[21] The problem is that this can introduce a bias, which would cause our analysis to give erroneous results. Table A13 in Appendix 10.17 shows that we indeed have quite a strong level of autocorrelation for several of our regressions.

The reason that we obtain such a high degree of autocorrelation is because of the structure of our data. Our data is arranged year by year, with each year containing every firm in our sample. The returns of the companies in our sample are probably highly correlated within each year, which would explain our results. We also tested sorting the data according to firm first and then by year, rather than the opposite. Since a firm's earnings are often correlated with the same firm's earnings the previous year, this led to an even higher amount of autocorrelation. To avoid this problem we perform our analysis using a LSDV regression. This should control for the individual firm effects, and thus cause the error terms to be less correlated (Gujurati, 2003).

A multicollinearity problem arises when two explanatory variables in a regression are highly correlated. This violates assumption 6 of our OLS regression assumptions in Appendix 10.16. The closer the correlation between the variables is to an exact linear relationship, the higher is the level of multicollinearity. A strong indication of this problem is when we have a high goodness-of-fit (R^2) and more than one non-significant coefficient (Gujurati, 2003). This is not the case in our regression. This is not surprising, since we really only have one explanatory variable. The other independent variable is simply the multiplication of this variable with a dummy-variable. Considering the issues with the OLS regression outlined above, it is clear that the LSDV is the superior approach when testing our fourth hypothesis.

6.4.3 Results of the LSDV regression

The LSDV regression reveals an interesting pattern. It seems that the P/E Multiple valuation generally does not produce the same results in the UK as in the rest of Europe. Conversely, the EV/EBITDA Multiple valuation produces comparable valuations for every one of the five industries. Table 4 below summarizes these findings. To see the details on the regression results that underlie this table, see Table A14 in Appendix 10.18 As we have explained above, we simply look at whether or not the slope dummy in the regression is significant to determine if the valuation model produces comparable results or not.

[21] Autocorrelation in the error term violates assumption 2 in this list.

Table 6. Are the Multiple valuation results between UK & rest of Europe comparable? YES/NO

This table shows the results from the LSDV regression, comparing the valuation of UK- and other European firms. The columns [a]-[c] each represent a valuation using one of our multiples. The table indicates "YES" if the multiples are comparable accroding to the LSDV regression, and "NO" if they are not comparable. Technically a slope dummy variable significant at a 5% level indicates that they are not comparable.

	[a]	[b]	[c]
	P/E	**P/EBT**	**EV/EBITDA**
Basic Resources	NO	NO	YES
Chemicals	YES	YES	YES
Food & Beverage	NO	YES	YES
Industrial G & S *excl. Aero & Def*	NO	NO	YES
Media	NO	YES	YES

If we simply look at the P/E valuation, it would be tempting to conclude that the valuation model is impacted by the fact that multiples are significantly lower in the rest of Europe than in the UK. However, as we have shown, the accounting differences in Europe are big enough to distort any "Law and Finance" effect on multiples. To see if the model is actually impacted by lower multiples in the rest of Europe, and not accounting issues, we instead examine the EV/EBITDA valuation. Since the EV/EBITDA Multiple valuation produces the same results in the UK as in the rest of Europe, we conclude that the lower multiples in the rest of Europe do not cause the model to undervalue UK firms.

The result that lower EV/EBITDA multiples in the rest of Europe do not impact the valuation model is surprising. When examining our other three hypotheses we have found that there is a "Law and Finance" effect, and that it leads to lower EV/EBITDA multiples in the rest of Europe than in the UK. So why are the valuation results based on these multiples not affected? We believe that the explanation lies in the way that the Multiple valuation is performed. Specifically, it results from the fact that we include firms from both the UK and other European countries in the peer group when valuing a firm. Thus only some fraction of the total number of peer companies will actually be from outside the UK. Since we calculate the model value using a median of the peer group multiples, this will weaken the effect of the lower multiples. In other words, since we mix both low and high multiples, the effect is averaged out. Thus the model value will still match the actual firm values in the UK quite well. This effect can be illustrated by our Multiple valuation model (Note that we have put in the EV/EBITDA multiple instead of just stating "*Mult.*" as in equation 7):

$$ModelValue_i^t \downarrow^{L\%} = Median\left(\frac{EV_j^t \downarrow^{X\%}}{EBITDA_j^t}, \frac{EV_{j+1}^t \downarrow^{X\%}}{EBITDA_{j+1}^t}, \ldots, \frac{EV_{N-1}^t \downarrow^{0\%}}{EBITDA_{N-1}^t}, \frac{EV_N^t \downarrow^{0\%}}{EBITDA_N^t}\right) \downarrow^{L\%} \cdot \tilde{E}^{t+2}\left[EBITDA_i\right] + \varepsilon \quad (12)$$

Suppose that the "Law and Finance" effect causes the enterprise values of some of the firms in the rest of Europe, where minority shareholder protection is lower, to decrease by X%. Then assume that there are some firms in the peer group which are in the UK and have higher market prices. Equation (12) shows that the total effect on the Multiple valuation model value "L", is smaller than the full X%. This means that the "Law and Finance" effect is weakened by the fact that we mix firms from both groups. While this example offers a very simplified picture, it illustrates our explanation of why higher multiples in the UK (or, equivalently, lower multiples in the rest of Europe) do not impact our valuation results.

➔ ***In summary, the data does not support our fourth hypothesis, hence we reject it.***

Table 7. Summary of emperical findings

This table provides a summary of our emperical findings. Column [1] presents our 4 hypotheses. Column [2] mentions if the hypothesis is rejected or not. Column [3] presents the emperical findings on the individual hypotheses.

[1] **Hypotheses**	[2] **Test-result**	[3] **Findings**
H_1: *P/E multiples in the UK are higher than in the rest of Europe, as predicted by "Law and Finance" theory.*	**Rejected**	P/E multiples are not higher in the UK. If there is a "Law and Finance" effect, it is overshadowed by accounting distortions
H_2: *EV/EBITDA multiples, which controls for most accounting differences, are higher in the UK than in the rest of Europe, as predicted by the "Law and Finance" theory.*	**Not Rejected**	EV/EBITDA multiples, which eliminate most cross-country accounting differences, are significantly higher in the UK then in the rest of Europe.
H_3: *After controlling for accounting differences, the higher multiples in the UK are driven by a more rigorous legal protection of minority shareholders.*	**Not Rejected**	There is a significant positive relationship between minority shareholder protection and EV/EBITDA multiples. This implies that higher UK EV/EBITDA multiples are due to the "Law and Finance" effect.
H_4: *A cross-European Multiple valuation is affected by higher UK earnings multiples.*	**Rejected**	The "Law and Finance" effect on multiples is not strong enough to impact peer-group multiple valuation.

Table 7 summarizes the finding of our analysis above. Our results have three principal implications. First, we show that that the "Law and Finance" effect can be observed using an earnings multiple, rather than the Tobin's Q measure employed in previous studies. Second, the finding that cross-country accounting differences are sufficiently large to overshadow this effect shows the importance of considering accounting when studying the field of "Law and Finance". We note that the "Law and Finance" effect is robust when controlling for these accounting differences. Finally, we have shown that the Multiple valuation technique averages away the impact of the "Law and Finance" effect. Therefore the inclusion of non-UK firms in the peer group does not cause the model to systematically undervalue UK firms. This shows that the valuation technique can be used to value UK firms, without having to restrict the search for comparable companies to the same country.

6.4.4 Why some industries are excluded

Above we have focused our analysis to the five industries that we believe are most likely to produce reliable results in our valuation model. We can now shed some more light on how we arrive at these five industries. To do this, we must look at the regression results for all the 24 industries in our sample (note that our original 18 industries increase because we subdivided some industries, for example *Health care*, in section 5.4.3).

Industries that produce a low goodness-of-fit measure

See Table A15 in Appendix 10.19 for the LSDV regression results for all the industries in our sample. It is now clear why we do not want to focus our analysis on the *Telecom*, *Financial Services-only Real Estate* and *Financial Services-only General Finance* and the *Retail* industry. The table clearly shows that these industries produce results with quite a low measure of explanatory power.[22] This indicates that the Multiple valuation model does not produce accurate results in these industries. We believe that the reason for these low goodness-of-fit measures can be explained by differences in growth rates and by accounting issues. For example, the *Telecom* industry has a quite high variance in growth rates (see appendix 10.11). We believe that the two financial services sectors are difficult to value because they are affected by the same accounting issues as the *Banks* and *Insurance* industries.

Industries driven by tax

Our analysis shows that the results of the two industries *Oil and Gas* and *Personal and Household goods-excluding Tobacco* are mainly driven by tax differences. To see this, consider that the P/E measure is the only multiple for which the firms in Europe can be used to value those in the UK. Apparently, the Multiple valuation model results are only comparable once we include taxes in the multiple. In particular, the fact that the P/E produces comparable valuations and not the P/EBT signals that the results are most likely due to a tax distortion. The results become less surprising when considering that these industries have among the highest variation in tax rates across Europe. As an example, consider the Oil and Gas industry. Not only does the value-added tax vary quite a lot across Europe in this industry, but there are also quite varying production taxes (Deelder, interview on 19-02-2007).

6.4.5 The accurateness of P/E valuation

We are surprised to see that the P/E Multiple valuation has a higher explanatory power (R^2-measure) than the EV/EBITDA Multiple valuation. This practically holds for all the industries that we analyze, with very few exceptions. While this completely contradicts the existing literature on multiples, it is in line with the findings of previous studies such as that of Von Berenberg-

[22] We have controlled every industry for obvious outliers, to make sure that our results are not distorted by one or two extreme observations. For example one firm in the Food and Beverage industry actually grew by 8% in 2002, while Thomson Financial reports 800%. We generally find very few such outliers.

Consbruch (2006) and Schreiner and Spremann (2007). We find this phenomenon highly interesting, and believe that it deserves further study.

We believe that this phenomenon may be stem from investor psychology. There is a tendency for investors to regard firms with unusually low P/E multiples as bargains. In fact, many funds have built trading strategies around this approach. This could actually prevent any multiple from deviating too far from the industry average. Since P/E multiple is the multiple given the most attention in practice, it should also be most heavily influenced by such effects. One of our interviewees emphasized the focus that many analysts put on the P/E multiple, and that this practice is so wide-spread that is could impact firm values (Huc, interview on 01-02-2007).

7 ROBUSTNESS CHECK

The methodology employed above has several limits. The main weaknesses are: the measure of minority shareholder protection (LLSV's anti-director rights index); the method of controlling for accounting differences; and the econometric model. Below we extend our methodology to see how robust our results are. We do not perform any robustness checks on the results concerning hypothesis 1 and 2 since we believe that the non-parametric test of medians is straightforward. However, several tests are presented for both hypotheses 3 and 4.

7.1 AFTER ELIMINATING ACCOUNTING DIFFERENCES, ARE HIGHER MULTIPLES IN THE UK DRIVEN BY A "LAW AND FINANCE" EFFECT?

As our analysis shows, our data supports our third hypothesis that the higher UK earnings multiples are driven by a "Law and Finance" effect after we control for accounting differences. We here test how dependent this result is on the methodology employed to measure the level of minority shareholder protection. We consider two indices constructed by Spamann (2006) as an alternative to LLSV's (2002) anti-director rights.

7.1.1 Different measures of minority shareholder protection

Spamann (2006) argues that the LLSV (1997) anti-director rights are measured inconsistently. With the help of lawyers from an impressive number of countries, he reconstructs the index to eliminate inconsistencies and mistakes.[23] Using this recoded index, he finds that the results of LLSV (1997, 1998) no longer hold. This seems to be true also for our data set. After we use Spamann's (2006) index we no longer find that higher shareholder protection leads to higher earnings multiples. See Table A16 in Appendix 10.20 for the results of the regression. We see that the coefficient of the index variable becomes insignificant in all five regressions.

However, we do not believe that this disproves the fact that there is a "Law and Finance" effect on earnings multiples. This seems to rather be a result of the poor specification of the LLSV (1997) index. Spamann (2006) also performs his analysis with the more recent specification of Djankov, La Porta, Lopez-de-Silanes and Shleifer (2005). This index specification was constructed to better measure minority shareholder protection. See Table A7 in Appendix 10.10 for a comparison between the three indices of minority protection. Spamann (2006) finds that the results of LLSV (1998) still hold considerably well given that this more advanced specification is employed. Again, we see similar results for our data. Using Spamann's (2006) index, that is constructed according to the Djankov et al. (2005) specification, we find that 3 out of our 5 industries still show a significant, positive relationship (at 5%) between the index and earnings multiples. In fact, 4 out of 5 industries show statistically significant results with a 10%

[23] See our Table A2 in Appendix 10.3 summarizing the criticism against LLSV (1997, 1998 and 2002).

significance level. Hence, while the criticism against the LLSV (1997) anti-director rights index seems to have some validity, we find significant evidence of a relationship between shareholder protection and earnings multiples even after accounting for this critique. In consequence, this robustness check reconfirms that we cannot reject our third hypothesis. Note however, that the effect is not as strong as when using the LLSV (1997) factors.

7.2 DO HIGHER MULTIPLES FOR UK FIRMS AFFECT CROSS-EUROPEAN PEER GROUP MULTIPLE VALUATION?

Above we showed that the "Law and Finance" effect was not large enough to affect a Multiple valuation, i.e. that we reject our fourth hypothesis. Below, we test the robustness of this conclusion. We test if our data is stationary, if the LSDV approach is appropriate and if our results are affected by growth and profitability as well as the method of controlling for accounting biases. Our results show that our conclusion does not change in any of these cases.

7.2.1 Non-stationarity

Although it does not specifically break any of the assumptions in Appendix 10.16 it can be shown that a regression on non-stationary data yields spurious results (Gujurati, 2003). Furthermore it often gives rise to very high goodness-of-fit measures, even when the actual explanatory power is low. To test whether this could help explain the high goodness-of-fit (R^2) of our analyses, we perform an augmented Dickey Fuller test.[24] The results are shown Table A17 in Appendix 10.21 . We see that for all our five industries we can reject the hypothesis of a unit root at 5 % level of significance. This tells us that we can perform our analysis without modifying our data further.

7.2.2 Fixed effects vs. random effects

A random effects (GLS) regression is not suitable to analyze our data. We have chosen our period of study over a relatively short time period and for quite stable industries. This should cause our firm-specific effects to stay relatively constant over the studied period. In such circumstances, a fixed effects (LSDV) regression makes more theoretical sense than a GLS regression. More importantly, previous studies show that the size of the error when performing Multiple valuation is correlated with firm size (Schreiner and Spremann, 2007; Baker and Ruback, 1999). This violates the assumption necessary for random effects to work, as explained in detail in Appendix 10.22. Clearly, if the error term is correlated with an explanatory variable, the fixed effect regression must be employed. To make sure that our economic reasoning holds up, we perform a Hausman test, the results of which are summarized in Table A18 in the Appendix 10.23. The Hausman test evaluates the appropriateness of the random effects approach. We see

[24] An indication of a unit root, i.e. non-stationary data, would tell us that we need to perform the analysis in first differences instead of on the raw data.

that for all but one of the regressions the appropriateness of random effects is rejected at a 5% level of significance. Given these reasons, we do not believe that a random effects regression would produce valid results.

7.2.3 Controlling for ROIC and growth

As we have shown, individual firm variation in growth and profitability (ROIC) are likely to have a distorting effect on our Multiple valuation model. We have taken several steps in order to minimize the problem. Most importantly, we have excluded the industries with the largest variance in ROIC and growth, and used an LSDV regression that controls for firm-specific differences. However, we want to test if any such distortions are still influencing our results. Hence, we repeat our LSDV regression analysis for our five main industries but also include growth and ROIC as explanatory variables. These variables should capture any effects from variation in profitability or growth rates still present.

Our results do not change when we include ROIC and growth as explanatory variables in our regressions. We still find that the EV/EBITDA Multiple valuation is unaffected by the higher multiples in the UK, and thus we still reject hypothesis four. The regression results are summarized in Table 8 below (for the numerical regression results underlying the table, see Table A19 in Appendix 10.24). In 14 out of 15 cases, the dummy variable indicates the same result as with the original model specification.

Table 8. Are the Multiple valuation results between UK & rest of Europe still comparable when controlling for ROIC & Growth? YES/NO

This table shows the results from the LSDV regression, comparing the valuation of UK- and other European firms when controlling for ROIC and growth. The columns [a]-[c] each represent a valuation using one of our multiples. The table indicates "YES" if the multiples are comparable accroding to the LSDV regression, and "NO" if they are not comparable. Technically a slope dummy variable significant at a 5% level indicates that they are not comparable. The highlighted result is the only one that is different compared to Table 4.

	[a]	[b]	[c]
	P/E	**P/EBT**	**EV/EBITDA**
Basic Resources	NO	NO	YES
Chemicals	NO	YES	YES
Food & Beverage	NO	YES	YES
Industrial G & S *excl. Aero & Def*	NO	NO	YES
Media	NO	YES	YES

7.2.4 An alternative way of controlling for accounting issues

As we discuss in section 2.3.2, an alternative way of controlling for accounting issues is to only examine firms with zero growth. Because we have nominal data, we expect a zero growth firm to grow at the inflation rate. As a rough estimate, we set the inflation rate to 3% and exclude all firms with an absolute growth rate above this number. We then repeat our LSDV regression

analysis from above to see if our results hold with this alternative methodology. The results are shown in Table 9 below (for the numerical results, see Table A20 in Appendix 10.25).

Table 9. Are the Multiple valuation results between UK & rest of Europe comparable when only using firms with maximum 3% growth? YES/NO

This table shows the results from the LSDV regression, comparing the valuation of UK- and other European firms when only using fims with absolute maximum growth of 3%. The columns [a]-[c] each represent a valuation using one of our multiples. The table indicates "YES" if the multiples are comparable accroding to the LSDV regression, and "NO" if they are not comparable. Technically a slope dummy variable significant at a 5% level indicates that they are not comparable. The highlighted results are the ones that change compared to Table 4.

	[a]	[b]	[c]
	P/E	**P/EBT**	**EV/EBITDA**
Basic Resources	YES	YES	YES
Chemicals	YES	YES	YES
Food & Beverage	NO	YES	YES
Industrial G & S *excl. Aero & Def*	YES	NO	YES
Media	YES	YES	YES

These results are quite telling. We still find that the EV/EBITDA Multiple valuation is unaffected by the higher multiples in the UK. We believe that the results of the EV/EBITDA Multiple valuation is unchanged since it already controls for a large part of possible accounting biases. Meanwhile, the P/E Multiple valuation now produces comparable results in 4 out of our 5 industries. Thus, the P/E Multiple valuation analysis now gives the same results as the EV/EBITDA Multiple valuation in every industry except one. This is in line with our previous findings, since the P/E valuation is now also free of most accounting differences. In summary, by controlling for accounting issues in this alternative way, the P/E Multiple valuation does not seem to be affected by a "Law and Finance" effect. The P/E Multiple valuation analysis therefore confirms our results from the EV/EBITDA Multiple valuation analysis, i.e. that we reject hypothesis four. Fortunately, the minimum number of UK firms in the regression stays above 6. This makes it unlikely that are results are biased because of a too low number of firms in the regression.

7.3 SUMMARY OF ROBUSTNESS CHECKS

- Using a more precise measure of minority protection by Spamann (2006), we still find evidence that higher minority protection leads to higher multiples, when controlling for accounting differences. Therefore, we still do not reject the third hypothesis.
- Our Multiple valuation data is stationary and the individual firm differences are fixed over the studied period.
- Controlling for growth and profitability, or changing the method of controlling for accounting differences, does not change our conclusion to reject the fourth hypothesis.

8 CONCLUSION

Our empirical findings lead to four conclusions, each relating to one of our four hypotheses. We present these separately below. We then present the meaning of our results in principle.

Conclusion 1

H_1: P/E multiples in the UK are higher than in the rest of Europe, as predicted by "Law and Finance" theory.

Our empirical findings show that P/E multiples are not higher in the UK than in the rest of Europe. However, this does not imply that P/E multiples are unaffected by differences in minority shareholder protection. Our accounting review demonstrates the array of cross-country accounting discrepancies affecting this multiple. We believe that these accounting differences overshadow the "Law and Finance" effect.

Conclusion 2

H_2: EV/EBITDA multiples, which controls for most accounting differences, are higher in the UK than in the rest of Europe, as predicted by the "Law and Finance" theory.

Our results confirm that the EV/EBITDA multiple, which takes out most of the accounting issues, is higher in the UK then in the rest of Europe. Nonetheless, this is not enough to say that the higher results in earnings multiples in the UK are driven by a "Law and Finance" effect. At the same time, this demonstrates that the many cross-European accounting distortions are strong enough to hide the potential "Law and Finance" effect present in the P/E multiples.

Conclusion 3

H_3: After controlling for cross-European accounting differences, the higher multiples in the UK are driven by a more rigorous legal protection of minority shareholders.

Our results indicate that the higher EV/EBITDA multiples for UK firms are caused by the "Law and Finance" effect. This confirms that investors are willing to pay a higher price for earnings when they are better legally protected against expropriation by controlling shareholders.

Conclusion 4

H_4: A cross-European Multiple valuation is affected by higher UK earnings multiples.

Controlling for cross-country differences in accounting, we show that the "Law and Finance" effect on earnings multiples does not affect cross-European Multiple valuation. This shows that the "Law and Finance" effect does not need to be accounted for when performing a cross-European Multiple valuation. It is important to note that this is due to the fact that the valuation model averages out the effect.

In summary, we find three very interesting principal results. First, we find evidence in line with the "Law and Finance" effect found by LLSV (2002). Second, we have an indication that international differences in accounting are sufficiently large to overshadow this effect, if not controlled for. This shows that international accounting theory is a necessary tool when studying the "Law and Finance" effect, despite being ignored by previous studies in this field. Third, we have taken the analysis one step further and examined whether the "Law and Finance" effect has a significant impact on Multiple valuation. Because of the way that the valuation technique takes an average of multiples from a mixed portfolio of firms, the "Law and Finance" effect is averaged out. This shows that the Multiple valuation technique in the UK does not necessarily have to be based on peers from the same country, even if multiples are significantly lower in the rest of Europe.

8.1 SUGGESTIONS FOR FURTHER RESEARCH

We are aware that our method of classifying firms according to industry is far from ideal. As we show, firms within an industry can have widely different growth rates and profitability, as well as tax rates, across Europe. For this reason, we welcome further studies that go into more detail to define the peer group. However, such efforts are unlikely to yield a sufficient number of peers to work with the kind of statistical analyses that we present here. It would of course also be very interesting so see to what extent our results hold up outside of Europe.

The IFRS implementation that has been carried out through Europe will logically facilitate a cross-country earnings comparison. We believe that it would be very interesting to repeat our analysis when the IFRS implementation has come further to see if the accounting distortions have become less pronounced. Thus we would like to see how our results hold five years in the future. Finally, one of the most interesting issues raised in our paper is the predictive power of the P/E Multiple valuation. Since this result seems counterintuitive and defies current theory, we welcome further studies on the subject.

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9.2 INTERVIEWS

Huc, Regis, Corporate Finance Specialist at McKinsey & Company, Travel and Logistics specialist, 30 min interview, 01-02-2007

Deelder, Bas, Corporate Finance Specialist at McKinsey & Company, Oil and Gas industry specialist, 20 min interview, 19-02-2007

Olthof, Martijn, Senior Corporate Finance Analyst at McKinsey & Company, Energy industry specialist, 30 min interview, 20-02-2007

10 APPENDICES

10.1 DICTIONARY AND IMPORTANT ABBREVIATIONS

Anti-director rights	"An index aggregating the shareholder rights which we labeled as "anti-director rights." The index is formed by adding 1 when: (1) the country allows shareholders to mail their proxy vote to the firm; (2) shareholders are not required to deposit their shares prior to the General Shareholders' Meeting; (3) cumulative voting or proportional representation of minorities in the board of directors is allowed; (4) an oppressed minorities mechanism is in place; (5) the minimum percentage of share capital that entitles a shareholder to call for an Extraordinary Shareholders' Meeting is less than or equal to 10 percent (the sample median); or (6) shareholders have preemptive rights that can only be waved by a shareholders' vote. The index ranges from 0 to 6." Source: LLSV (1998).
BS	The balance sheet of a company.
Civil law	Sometimes called Code law. Civil law countries tend to have a legal system where laws are written centrally through jurisprudence.
Common Law	Civil law countries generally have a legal system where law is made by judges and subsequently incorporated into legislature.
Dummy variable	A variable that takes the value 1 if a certain condition is fulfilled, and zero otherwise (Here if a firm is listed in the UK).
EBIT	Earnings before interest and taxes.
EBITDA	Earnings before interest, taxes, depreciation and amortization.
EBT	Earnings before taxes.
EV	Short for enterprise value, which is the sum of market capitalization and net debt.
Free cash flow	Calculated as NOPLAT plus depreciations minus capital expenditures +/- changes in net working capital.
GLS	Generalized least squares, also referred to as panel data random effects regression.
Goodness-of-fit	Simply put, a measure of how well a statistical regression fits sample data. More technically, how many percent of the variation in the dependent variable that is explained by the independent variables.
Growth	Defined in our study as growth in the earnings of a company.

Harmonic mean	A measure of central location. Calculates the inverse average reciprocals of the figures being aggregated. $Harmonic\,mean = \frac{N}{\frac{1}{a_1} + \frac{1}{a_2} + ... + \frac{1}{a_N}}$
ICB	Dow Jones Indexes and FTSE have created the industry classification system called the Industry Classification Benchmark (ICB).
LSDV	Least squares dummy variable regression. Also referred to as panel data fixed effect regression.
Market Capitalization	Total value of all outstanding shares of a company.
Minority expropriation	The controlling shareholder's extraction of private benefits from the firm.
Net debt	Total value of long- and short term debt, minus cash and cash equivalents.
NOPLAT	Net operating profit less adjusted taxes.
OLS	Ordinary least squares.
P&L	Profit and loss statement of a company.
Peer group	A group of comparable companies used to value a firm with relative valuation.
Private benefits of control	The controlling owners ability to get personal benefits from the company (pecuniary and non-pecuniary benefits).
ROIC	The return gained from invested capital in a company, in other words the profitability.
Relative valuation	Refers to valuation models that value a firm by using the market prices of similar companies.
WACC	The capital costs of a company calculated by a weighted average of cost of debt and cost of equity.

10.2 DESCRIPTIVE DATA

Table A1. Descriptive data

We present our data separately for the 5 industries of interest. All numbers are in millions of US dollars. Row [1]-[8] present the different variables and multiples for each of our 5 selective industries. Column [a] presents the number of observations for each variable. The mean, [b], is calculated as an ordinary arithmetic mean. The standard deviation, [c], is included to give a general idea of the accuracy and spread of the median multiples. The median multiples are constructed for each firm and year, calculated as the median of the same multiple for all other firms in the European market at the time.

		[a] # of observations, N	[b] Mean	[c] Std.Dev.	[d] Min	[e] Max
	Basic Resources					
[1]	median(PE)	360	9.88	2.84	3.16	14.57
[2]	median(PEBT)	360	7.06	1.67	2.72	9.55
[3]	median(EV/EBITDA)	309	26.54	4.67	18.67	35.32
[4]	Earnings, E	243	728.19	1545.05	27.31	12795.43
[5]	EBT	245	1108.27	2535.21	24.50	22384.05
[6]	EBITDA	187	1701.11	2956.05	53.33	20779.69
[7]	Market capitalization	283	6988.46	13668.69	107.14	122164.80
[8]	Enterprise value	258	7894.78	13890.15	136.91	130034.00
	Chemicals					
[1]	median(PE)	360	13.41	1.67	9.02	16.08
[2]	median(PEBT)	360	9.17	1.24	6.23	10.98
[3]	median(EV/EBITDA)	309	34.39	4.64	24.80	41.73
[4]	Earnings, E	256	464.88	584.82	11.27	4277.42
[5]	EBT	268	708.06	1044.96	17.71	8528.53
[6]	EBITDA	205	1291.09	1869.85	29.51	12739.15
[7]	Market capitalization	292	6057.56	8246.50	180.14	49000.03
[8]	Enterprise value	264	6812.39	8672.78	191.11	44063.34
	Food & Beverage					
[1]	median(PE)	492	15.00	1.71	12.26	18.91
[2]	median(PEBT)	492	9.79	1.39	7.92	13.17
[3]	median(EV/EBITDA)	441	38.99	4.15	33.39	49.56
[4]	Earnings, E	332	742.00	1233.66	1.41	8102.86
[5]	EBT	345	1164.65	1849.36	1.98	11111.45
[6]	EBITDA	265	1793.59	2706.20	3.92	14080.92
[7]	Market capitalization	401	11665.61	20793.30	16.23	136141.90
[8]	Enterprise value	381	12664.90	22069.57	85.35	122535.00
	Industrial G & S *excl. Aero & Def*					
[1]	median(PE)	1956	13.32	1.12	11.07	15.06
[2]	median(PEBT)	1956	8.79	0.88	7.40	10.52
[3]	median(EV/EBITDA)	1905	35.10	4.84	23.70	42.25
[4]	Earnings, E	1358	222.81	478.88	0.48	7223.61
[5]	EBT	1467	323.44	703.52	3.10	10200.54
[6]	EBITDA	1109	579.33	1218.48	19.78	13681.26
[7]	Market capitalization	1572	3164.94	6378.62	31.80	80852.62
[8]	Enterprise value	1438	3632.01	7825.43	24.00	86285.39
	Media					
[1]	median(PE)	696	21.55	5.74	14.52	34.84
[2]	median(PEBT)	696	13.04	2.92	9.79	19.37
[3]	median(EV/EBITDA)	645	49.07	14.49	35.07	87.39
[4]	Earnings, E	487	242.78	329.03	0.00	3572.31
[5]	EBT	518	404.63	581.90	1.65	6095.94
[6]	EBITDA	417	680.13	1097.33	7.92	8538.34
[7]	Market capitalization	542	4997.73	6839.98	87.06	64647.89
[8]	Enterprise value	492	5608.81	8811.16	50.28	91111.54

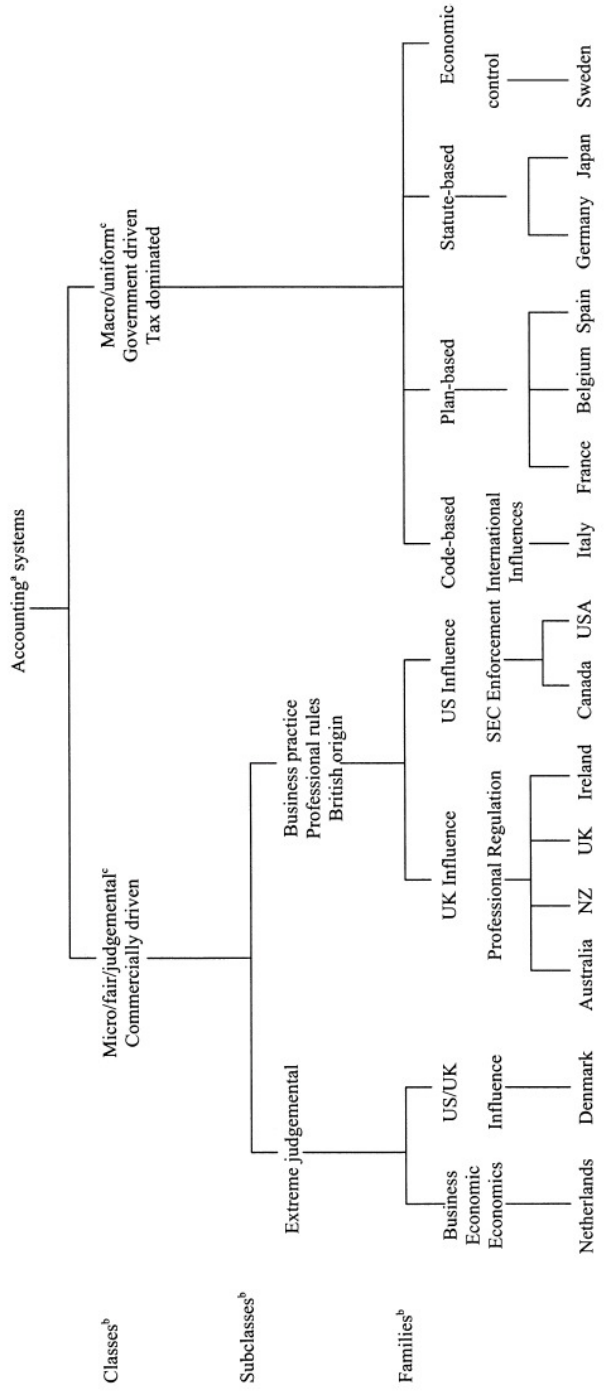
10.3 OVERVIEW OF PREVIOUS FINDINGS ON "LAW AND FINANCE"

Table A2. Previous findings on Law and Finance: LLSV support and criticism

Rows [1]-[10] show the most prominent works in favor of the law and finance approach. The critique against the work of LLSV and indeed the current nature of the whole field of law and finance can be divided into two broad categories. First some studies [11]-[13] agree that shareholder protection laws (as measured by LLSV's antidirector rights) drive firm value. However, they do not agree that today's shareholder protection in a country is determined by it's legal origin. Secondly, other studies reject the underlying assmption that shareholder protection laws actually drive financial development and ultimately firm values. These are described in rows [14]-[28]. Column [b] shows the number of countries in the study.

		[a] Year	[b] N	[c] Countries	[d]	[e] Main conclusion relevant for our paper
	In favor of law and finance					
[1]	LLSV	1997	49	Global		Legal origin determines the development of financial markets.
[2]	LLSV	1998	49	Global		Higher shareholder protection in common law countries leads to fin. development and ec. growth.
[3]	LLSV	1999	152	Global		Legal origin, but not religion and culture, has a significant impact on economic growth.
[4]	Levine	1998	42	Global		Legal origin determines development of the banking system which drives economic growth.
[5]	Levine, Loayza and Beck	2000	83	Global		Legal origin determines development of financial intermediaries that produce economic growth.
[6]	Beck, Demirgüç-Kunt and Levine	2003	70	Former colonies		Controlling for endowment effects (geography, disease) legal origin impacts financial development.
[7]	Stulz and Williamson	2003	50	Global		The impact of culture and religion on shareholder rights dissapear when controlling for legal origin.
[8]	LLSV	2002	27	Wealthy economies		Higher shareholder protection in a country leads to higher valuations of firms.
[9]	Claessens and Laeven	2003	44	Global		Poor resource allocation leads to low firm valuations in coutries with low investor protection.
[10]	Caprio, Laeven and Levine	2003	44	Global		Weak shareholder protection laws lower bank valuations in that country.
	Criticism against law and finance				**Criticism concerns**	
	The shareholder protection, firm value nexus					
[11]	Dyck and Zingales	2002	39	Global	Other factors	Market competition, tax compliance and an active media are as important as shareholder protection.
[12]	Guiso, Sapienza and Zingales	2000	1	Italy	Other factors	Social capital substitutes shareholder protection and significantly impacts equity ownership/values.
[13]	Holmén and Högfeldt	2002	1	Sweden	Political factors	Political and institutional factors e.g. extraction of non-pecuniary benefits influence firm valuation.
	Legal origin, financial development nexus					
[14]	Merryman	1996	-	Global	Country classifications	Former french colonies legal systems that vastly differs from that in France itself.
[15]	Berkowitz, Pistor and Richard	2001	49	Global	causality	The transplantation process of the legal system is more important than legal origin.
[16]	Pound	1991	1	U.S.	Political factors	Political factors (SEC) have a bigger impact on the institutional setting in the U.S. than legal origin.
[17]	Pagano and Volpin	2001	21	Developed countries	Political factors	A political economy approach. Shows that mainly political factors determine laws and enforcement.
[18]	Rajan and Zingales	2003	24	Global	Political factors	The law and finance predictions do not hold historically e.g. for France and UK.
[19]	Haber, Razo and Maurer	2003	1	Mexico	Political factors	The political setting has a large impact on financial development, even during political turmoil.
[20]	Roe	1994	3	U.S, Germany and Japan	Political factors	Politics and economies of scale have lead to large firms with dispersed, weak shareholders.
[21]	Jones	1981	-	Europe & Asia	Other factors	The endowment view, i.e. that geography and disease historically determined economic growth.
[22]	Crosby	1989	-	Global	Other factors	Disease and geography historically determined the economic and institutional setting of Europe.
[23]	Engerman and Sokoloff	1997	2	U.S. & Canada	Other factors	Economic development is driven mainly by initial factor endowments but also political and eqality.
[24]	Acemoglu, Johnson and Robinson	2003	32	Fomer colonies	Country classifications	Europeans set up extractive instituations in some colonies, later perpetuated by local interests.
[25]	Djankov, La Porta, Lopez-de-Silanes, Shleifer	2005	72	Global	Shareholder protection measure	Substitute Antidirector rights of LLSV (1998) by anti-self-dealing index, show that results still hold.
[26]	Siems	2006	129	Global	Country classifications	Legal families are a too coarse to categorize countries, language/colonization better.
[27]	Spamann	2006	49	LLSV (1998)	Shareholder protection measure	After recoding, LLSV (1998) results do not hold, but holds with specification of Djankov et al. (2005).

10.4 NOBES' ACCOUNTING CLUSTER MODEL



[a] This is an abbreviated term for corporate financial reporting.
[b] These terms, while borrowed from biology, should be interpreted merely as loose labels.
[c] The terms at these and other branching points are merely labels to be used as shorthand to try to capture some of the attributes of the members of the accounting systems below them. This classification has been prepared by a UK researcher and may contain usage of terms that will mislead those from other cultures.

Figure 1. Groupings of Some Major Countries (Source: Nobes, 1983).

10.5 RADEBAUCH, GRAY AND BLACK ACCOUNTING CLUSTER MODEL

Model 2. Cultural influences on accounting systems

This model shows how Radebaugh et al. (2006) split up the accounting practices into different accounting families. Columns [1]-[4] represent the different accounting clusters. In this adapted model, we only mention the European countries that are interesting to our study.

[1] **Anglo-Saxon**	[2] **Nordic**	[3] **Latin**	[4] **Germanic**
UK	Denmark	Belgium	Austria
	Finland	France	Germany
	Norway	Italy	Switzerland
	Sweden	Portugal	
	The Netherlands	Spain	

Source: adapted from Radebauch et al. (2006)

Table A3a. Key drivers of accounting differences: From flexibility to conservatism

The table summarizes the main differences in accounting practices between UK, The Netherlands, France and Germany. Column 1 indicates the country and to which accounting cluster it belongs according to Radebauch, Gray and Black (2006). Columns 3 - 11 discribe the treatment per country of the individual factors that we believe account for the highest discrepancy between the analyzed countries. Column 12 provides a general description of the accounting practice in the given country.

[1] Country/ Cluster	[3] Goodwill	[4] R&D	[5] Leases	[6] Tangible fixed assets	[7] Inventory	[8] Pensions
UK = Anglo-Saxon	- either immediate write-off to reserves or amortization through P&L over economic life	- research cost: expensed as incurred - development cost: usually expensed but may be deferred	- very complex legislation - financial leases need to be capitalized - many companies keep the leases off-balance sheet and hence classify them as operating	- either historic cost or a valuation (most often replacement cost is used) - no rules on frequency of revaluation (changed in 1999) - depreciation: over asset life - no depreciation of investment assets	- valued at lower of cost and realizable value - FIFO - LIFO prohibited - percentage of completion method recommended for long-term contracts	- all obligations should be accounted for - large firms tend to opt for defined benefit plans
The Netherlands = Nordic	- asset may be: charged directly against profit, written off against reserves, amortized over 5y - amortization over 5y requires justification	-R&D normally expense but allowed to capitalize if strong expectation of future benefit - max 5y amortization period	- financial leases normally capitalized	- 5 categories: land & building, plant & machine, other operating assets, assets under construction, assets not used in production - historic cost or current value - depreciation: econmically realistic period	- actual cost, replacement cost or other current cost method allowed - FIFO most used, but LIFO also allowed	- required to be done by independent pension fund or insurance company - full pension obligation accounted for each year → difference from actual amount paid → asset or liablity
France = Latin	- no limitation on amortization period - mostly amortized over 20-40y period	-R&D normally expensed but allowed to capitalize if strong expectation of future benefit - max 5y amortization period	- financial leases may be capitalized	- historic cost accounting - depreciation: building 20-30y, plant & machinery 10y, vehicles 5y	- valued at lower of cost, realizable value or replacement cost - FIFO and LIFO permitted	- both cost and debt appears in P&L and BS respectively
Germany = Germanic	- amortization up to 40y allowed	- R&D required to be expensed immediately	- determined by tax law → each lease needs to be determined individually - avoidance of classification as financial lease is very common	- historic cost accounting - revaluation only permitted at or below cost - all depreciation methods used	- at cost or market, whichever is lower - FIFO, LIFO, moving avg allowed	- mostly defined benefit - very often understated!!!

Source: Blake and Amat (1993), Nobes and Parker (2000) and Mueller, Gernon and Meek (1991)

Table A3b. Key drivers of accounting differences: From flexibility to conservatism

The table summarizes the main differences in accounting practices between UK, The Netherlands, France and Germany. Column 1 indicates the country and to which accounting cluster it belongs according to Radebauch, Gray and Black (2006). Columns 3 - 11 discribe the treatment per country of the individual factors that we believe account for the highest discrepancy between the analyzed countries. Column 12 provides a general description of the accounting practice in the given country.

[1] Country/ Cluster	[9] Tax	[10] Provisions & Reserves	[11] Foreign currency translation	[12] General
UK = Anglo-Saxon	- potential large difference between accounting and taxable income - partial deferral by liability method	- allowed for future operating losses & for reorganization costs if a detailed plan is in place that cannot realistically be withdrawn	- in case the trade of the foreign firm is more dependent on the economic situation of the investing firm's currency → translation gains or losses are taken to P&L - if not, gains or losses to reserves	- strong & independent accouting profession - accounting methods formulated by private sector regulators - UK accounting has adapted substantially according to EU directivs, however it continues to be the **most flexible and least conservative in Europe**
The Netherlands = Nordic	- full allocation (partial also allowed) using liability method	- allowed for future operating losses & for reorganization costs	- all gains and losses taken to the P&L	- strong international approach to accoutning → international accounting standards well respected - traditional accounting regulation is flexible - taxation is relatively unimportant as an influence **- closest to UK accounting**
France = Latin	- full allocation using liability method	- required for estimated charges and losses	- losses are generally charged to P&L when they occur - gains are normally only recorded when realized	- French accounting differs between statutory and consolidated statements (the latter are discussed here) - main feature: legalistic nature → accounting provisions come from commercial & fiscal legislation - well-developed system of accounting regulation **- more conservatism**
Germany = Germanic	- accounting & tax treatment normally equal - in case of a difference → liability method	- obliged to set up for uncertain liabilities, for potential losses from pending transactions, for repairs & maintenance expenses, for land reclamation expanses, and for guarantee expenses	- receivalbles recorded at lower of historic rate and or closing rate - payables reported at higher amount of historic rate or closing rate	- accounting is dominated by legal prescription and stongly linked to the tax system → expenses are only considered to be tax-deductible if they are also included in the commercial accounts **- most conservative accounting**

Source: Blake and Amat (1993), Nobes and Parker (2000) and Mueller, Gernon and Meek (1991)

10.7 ACCOUNTING ADJUSTMENTS

Table A4. Some adjustments necessary when comparing UK- to other European firms

Column [1] presents the accounting features that differ between the Anglo-Saxon model and the Continental model. Column [2] illustrates several specific accouting issues. Column [3] presents the necessary adjustments to be made before UK reporting can be compared with that of Continental model countries.

[1] General Accounting feature	[3] Adjustment
Conservatism	Increase net asset values
Historical cost	Increase net asset values
[2] **Specific Accounting feature**	
LIFO	Increase inventory values for some
Translation	Extract translation adjustments from German & other users of the "tempral" method
Consolidation	Adjust for a lack of consolidation
Associated companies	Increase net assets and profit in cases of non-use of equity method
R&D	UK unusual in allowing capitalisation
Leases	Increase fixed assets & liabilities where leases are not capitalised
Pensions	Examine carefully. Extract any pension provisions from shareholders' funds
Provisions	Increase shareholders' funds by portion of general provisions
Tax	Decrease depreciation where caused by tax

Source: adapted from Nobes (1992)

10.8 ICB CLASSIFICATION

Table A5. ICB Supersectors & Sectors

This table provides an overview of the Supersectors, column [1] and its Sectors, column [2], according to the Industry Classification Benchmark (ICB). The codes of each supersector and sector is also provided. The shaded supersectors are the ones we use in our final analysis.

[1] Supersector		[2] Sectors	
Automobiles & Parts	*3300*	Automobiles & Parts	3350
Banks	*8300*	Banks	8350
Basic Resources	*1700*	Forestry & Paper	1730
		Industrial Metals	1750
		Mining	1770
Chemicals	1300	Chemicals	1350
Construction & Materials	*2300*	Construction & Materials	2350
Financial Services	*8700*	Real Estate	8730
		General Financial	8770
Food & Beverage	*3500*	Beverages	3530
		Food Producers	3570
Health Care	*4500*	Pharmaceuticals & Biotechnology	4570
		Healthcare Equipment & Services	4530
Industrial Goods & Services	*2700*	Industrial Transportation	2770
		Electronic & Electrical Equipment	2730
		Industrial Engineering	2750
		General Industrials	2720
		Support Services	2790
		Aerospace & Defense	2710
Insurance	*8500*	Nonlife Insurance	8530
		Life Insurance	8570
Media	*5500*	Media	5550
Personal & Household Goods	*3700*	Leisure Goods	3740
		Household Goods	3720
		Personal Goods	3760
		Tobacco	3780
Retail	*5300*	General Retailers	5370
		Food & Drug Retailers	5330
Travel & Leisure	*5700*	Travel & Leisure	5750
Technology	*9500*	Technology Hardware & Equipment	9570
		Software & Computer Services	9530
Telecommunications	*6500*	Fixed Line Telecommunications	6530
		Mobile Telecommunications	6570
Oil & Gas	*0500*	Oil & Gas Producers	530
		Oil Equipment & Services	570
Utilities	*7500*	Electricity	7530
		Gas, Water & Multiutilities	7570

10.9 ROIC AND GROWTH COMPARISON

Table A6. ROIC & Growth comparison

This table compares the ROIC and Growth for the different industries we analyzed. Column [a] represents the ROIC analysis, whereas column [b] presents the Growth analysis. Columns [1] and [3] represent the Median, Mean and Standard Deviation for both variables. Column [4] ranks the industries according to its Standard Deviation, with 1 being the industry with the lowest Standard Deviation. In accordance with Goedhart et al. (2005), we prefer the industries with a low ROIC and Growth Standard Deviation.

	[a] ROIC				[b] Growth			
	[1] Median	[2] Mean	[3] St. Dev	[4] Rank	[1] Median	[2] Mean	[3] St. Dev	[4] Rank
Automobil and Parts	6.17	7.65	7.92	22	8.44	10.34	7.19	19
Banks	2.40	3.10	3.43	24	9.97	11.84	9.73	10
Basic Resources	9.19	9.85	10.41	19	5.67	9.53	14.26	7
Chemicals	9.58	9.78	9.64	20	8.00	9.30	5.54	24
Construction and materials	8.78	9.66	10.71	16	10.00	12.21	11.99	8
Financial Services	6.67	10.10	12.52	15	7.00	9.13	8.97	13
Financial Services *only General Finance*	8.84	12.09	13.68	12	10.75	12.14	8.27	15
Financial Services *only Real Estate*	6.14	7.81	10.60	18	5.00	6.64	8.78	14
Food & Beverage	10.00	10.78	10.65	17	8.00	9.17	5.58	23
Health care	12.54	9.75	28.11	7	12.50	14.17	17.70	3
Health care *only Pharmaceutical & Bio*	13.28	7.74	32.83	3	12.06	12.64	14.98	6
Health care *only Equipment & Services*	11.95	12.45	19.88	8	13.20	16.42	20.95	1
Industrial G & S *excl Aero & Def*	10.94	13.24	28.19	6	9.19	10.71	9.58	12
Industrial Goods and Services	10.85	13.21	28.28	5	9.68	10.81	9.69	11
Insurance	7.47	9.30	13.88	11	8.00	8.03	8.21	16
Media	12.61	14.02	31.23	4	10.00	12.49	15.15	5
Personal & Hh goods *excl. Tobacco*	12.89	14.31	8.92	21	10.00	10.80	6.42	21
Personal and Household goods	13.30	15.65	12.62	14	10.00	10.63	6.13	22
Retail	10.86	15.05	14.83	9	10.00	10.30	6.69	20
Travel and Leisure	7.91	15.74	106.93	1	10.00	11.26	7.66	17
Technology	8.78	9.65	54.04	2	10.00	12.21	16.31	4
Telecom	12.71	14.48	14.43	10	12.26	15.27	19.85	2
Oil and Gas Industry	10.38	9.93	13.24	13	8.71	10.67	10.95	9
Utilities	7.23	8.00	6.24	23	8.36	8.86	7.56	18

10.10 DIFFERENT "LAW AND FINANCE" INDICES FOR COUNTRIES INCLUDED IN THE STUDY

Table A7. Law and Finance codings

This table provides an overview of the different Law & Finance indices of shareholder protection. Column [1] represents the coding according to the origional LLSV (1998) paper. Column [2]shows the same LLSV index recoded by Spamann (2006). Column [3] shows the recoded index with Djankov et al (2005) specifications.

	[1] Original LLSV (1998)	[2] Spamann (2006)	[3] Djankov et al (2005)
Belgium	0	2	2
Italy	1	2	1
Germany	1	4	2
Greece	2	3	2
Netherlands	2	4	2
Austria	2	4	3
Switzerland	2	3	2
Denmark	2	4	3
France	3	5	3
Portugal	3	3	2
Finland	3	4	3
Sweden	3	4	3
Spain	4	5	3
Norway	4	4	3
UK	5	4	4
AVG	**2.47**	**3.67**	**2.53**

10.11 MEDIAN P/E MULTIPLE COMPARISON UK – AND THE REST OF EUROPE

Table A8. Non-parametric equality-of-medians test of P/E

This table provides a comparison between the median P/E multiple for the UK and the rest of Europe. We perform a nonparametric K-sample test on the equality of medians. It tests the null hypothesis that the K-samples were drawn from populations with the same median. Columns [1]&[2] present the UK and the European median respectively. Column [3] indicates the chi² and column [4] the p-value. The chi²s that are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".

	P/E			
	[1] UK	[2] rest of Europe	[3] chi²	[4] p-value
Basic resources	12.56	9.65	11.703***	(0.00)
Chemicals	13.24	13.95	1.93	(0.17)
Food & Beverage	13.54	15.44	4.74**	(0.03)
Industrial G & S *excl. Aero & Def*	13.43	13.79	0.67	(0.41)
Media	20.57	19.92	0.052	(0.82)

10.12 MEDIAN EV/EBITDA MULTIPLE COMPARISON UK – REST OF EUROPE

Table A9. Non-parametric equality-of-medians test of EV/EBITDA

This table provides a comparison between the median EV/EBITDA multiple for the UK and the rest of Europe. We perform a nonparametric K-sample test on the equality of medians. It tests the null hypothesis that the K-samples were drawn from populations with the same median. Columns [1]&[2] present the UK and the European median respectively. Column [3] indicates the chi² and column [4] the p-value. The chi²s that are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".

	EV/EBITDA			
	[1] **UK**	[2] **rest of Europe**	[3] **chi²**	[4] **p-value**
Basic resources	6.73	5.49	6.194**	(0.01)
Chemicals	7.10	5.85	6.479**	(0.01)
Food & Beverage	7.97	6.69	8.544***	(0.00)
Industrial G & S *excl. Aero & Def*	6.84	6.52	2.726*	(0.10)
Media	10.55	9.07	5.15**	(0.02)

10.13 MULTIPLE VALUATION OLS REGRESSION FOR OUR FIVE MAIN INDUSTRIES

Table A10. Multiple valuation OLS regression for our five main industries

In total, this table shows the results of 15 different OLS regressions. Each was performed with the market cap. as the dependent variable. The columns [a]-[c] each represent a valuation using a different multiple. The column named "UK" shows the values for the two dummy variables included in each regression. The rows [1] show the slope and the slope dummy, with its t-value within parenthesis below. The rows [2] is the coefficient for the constant, with the corresponding t-value within parenthesis below. The t-values that are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".The rows [3] present the r-squares for the regression. Finally, the rows [4] give the the number of observations that are used in the regression. Figures are in millions.

	[a] P/E		[b] P/EBT		[c] EV/EBITDA	
	Rest of Europe	UK	Rest of Europe	UK	Rest of Europe	UK
Basic Resources						
[1] **Model value**	1.03***	-0.342**	0.955***	-0.425**	0.174***	0.011
	(7.170)	-(2.34)	(5.78)	-(2.54)	(10.85)	(0.66)
[2] **Constant**	-63.03	4876.821***	164.828	6642.309***	-528.14	2991.456***
	-(0.1)	(4.13)	(0.21)	(5.02)	-(1.02)	(3.65)
[3] **R²**	0.81		0.71		0.94	
[4] **Number of obseravtion**	237		241		186	
	P/E		**P/EBT**		**EV/EBITDA**	
	Rest of Europe	UK	Rest of Europe	UK	Rest of Europe	UK
Chemicals						
[1] **Model value**	0.988***	-0.063	0.753***	0.125	0.119***	0.019
	(48.79)	-(0.5)	(40.52)	(1.02)	(42.49)	(0.82)
[2] **Constant**	598.235**	-562.614	1861.016***	-1752.006***	1314.108***	-1109.689**
	(2.57)	-(1.09)	(7.16)	-(3.33)	(5.01)	-(2.02)
[3] **R²**	0.91		0.88		0.91	
[4] **Number of obseravtion**	256		268		205	
	P/E		**P/EBT**		**EV/EBITDA**	
	Rest of Europe	UK	Rest of Europe	UK	Rest of Europe	UK
Food & Beverage						
[1] **Model value**	1.191***	-0.083***	1.217***	-0.153***	0.224***	-0.016**
	(74.95)	-(2.64)	(78.13)	-(5.56)	(62.68)	-(2.51)
[2] **Constant**	41.198	-675.798	-142.525	-341.161	-1466.077***	268.060
	(0.12)	-(0.97)	-(0.43)	-(0.55)	-(3.39)	(0.34)
[3] **R²**	0.96		0.96		0.95	
[4] **Number of obseravtion**	329.00		341		263	
	P/E		**P/EBT**		**EV/EBITDA**	
	Rest of Europe	UK	Rest of Europe	UK	Rest of Europe	UK
Industrial G & S *excl. Aero & Def*						
[1] **Model value**	0.887***	0.055	0.838***	0.145***	0.138***	0.02*
	(94.940)	(1.050)	(89.1)	(2.86)	(78.54)	(1.96)
[2] **Constant**	606.776***	-400.057**	714.725***	-585.921***	530.028***	-390.174*
	(7.36)	-(2.39)	(8.09)	-(3.75)	(4.86)	-(1.93)
[3] **R²**	0.8799		0.86		0.86	
[4] **Number of obseravtion**	1307		1412		1086	
	P/E		**P/EBT**		**EV/EBITDA**	
	Rest of Europe	UK	Rest of Europe	UK	Rest of Europe	UK
Media						
[1] **Model value**	0.903***	-0.065	0.783***	0.125***	0.108***	0.056***
	(38.350)	-(1.300)	(39.73)	(2.75)	(35.2)	(5.88)
[2] **Constant**	535.588**	426.012	880.921***	-116.574	1507.537***	-545.882
	(2.55)	(0.98)	(4.3)	-(0.32)	(6.68)	-(1.23)
[3] **R²**	0.80		0.80		0.79	
[4] **Number of obseravtion**	480		511		412	

10.14 MULTIPLE VALUATION OLS REGRESSION: SIMPLIFIED TABLE

Table A11. Are the multiple valuation results between UK & rest of Europe comparable? YES/NO

This table shows the results from the OLS regression comparing UK and rest of Europe multiple valuations. Regression are performed industry by industry. The columns [a]-[c] each represents one of our multiples. The table indicates "YES" if the multiples are comparable accroding to the OLS regression, and "NO" if they are not comparable. Technically a slope dummy variable significant at a 5% level indicates that they are not comparable.

	[a] **P/E**	[b] **P/EBT**	[c] **EV/EBITDA**
Automobil and Parts	YES	YES	YES
Banks	NO	YES	NO
Basic Resources	NO	NO	NO
Chemicals	YES	NO	NO
Construction and materials	YES	NO	NO
Financial Services	NO	NO	NO
Financial Services *only General Finance*	NO	NO	NO
Financial Services *only Real Estate*	NO	NO	NO
Food & Beverage	NO	NO	NO
Health care	NO	NO	YES
Health care *only Pharmaceutical & Bio*	NO	NO	NO
Health care *only Equipment & Services*	YES	NO	NO
Industrial G & S *excl. Aero & Def*	NO	NO	YES
Industrial Goods and Services	NO	NO	NO
Insurance	YES	YES	YES
Media	YES	NO	NO
Personal & Hh goods *excl. Tobacco*	YES	NO	YES
Personal and Household goods	NO	NO	NO
Retail	NO	NO	YES
Travel & Leisure	NO	NO	NO
Technology	NO	YES	YES
Telecommunication	YES	YES	NO
Oil and Gas Industry	YES	NO	NO
Utilities	NO	NO	YES

Table A12. Multiple valuation OLS regression

In total, this table shows the results of 72 different OLS regressions. Each was performed with the market cap. as the dependent variable. The columns [a]-[c] each represent valuations using different multiples. Column [1] and [2] present the t-value of the slope and slope dummy respectively. The t-values that indicate that the variables are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".The column [3] present the r-square for the regression.

	[a] P/E			[b] P/EBT			[c] EV/EBITDA		
	[1] Model value, t	[2] Constant, t	[3] R^2	[1] Model value, t	[2] Constant, t	[3] R^2	[1] Model value, t	[2] Constant, t	[3] R^2
Automobil and Parts	0.37	-0.05	0.86	0.47	0.13	0.93	1.34	-0.99	0.87
Banks	2.89***	0.86	0.93	1.49	1.28	0.93	-10.02***	5.97***	0.86
Basic Resources	-2.34**	4.13***	0.81	-2.54**	5.02***	0.71	0.66	3.65***	0.94
Chemicals	-0.5	-1.09	0.91	1.02	-3.33***	0.88	0.82	-2.02**	0.91
Construction and materials	0.17	-1.36	0.88	3.46***	-2.72***	0.88	2.53**	-2.46**	0.57
Financial Services	-3.82***	2.3**	0.68	17.92***	-9.81***	0.33	9.39***	-5.21***	0.58
Financial Services*only General Finance*	-2.28**	0.61	0.62	12.43***	-8.55***	0.34	9.18***	-5.93***	0.47
Financial Services*only Real Estate*	-2.06**	2.69***	0.77	8.98***	-3.18***	0.72	3.82***	-0.9	0.79
Food & Beverage	-2.64***	-0.97	0.96	-5.56***	-0.55	0.96	-2.51**	0.34	0.95
Health care	-3.35***	1.67*	0.94	-4.89***	1.33	0.92	-1.79*	1.41	0.92
Health care *only Pharmaceutical & Bio*	-3.09***	2.13**	0.94	-4.09***	1.51	0.93	-2.07**	1.58	0.90
Health care*only Equipment & Services*	0.06	-0.35	0.89	4.17***	-2.71***	0.72	4.9***	-3.03***	0.57
Industrial G & S *excl. Aero & Def*	1.05	-2.39**	0.87	2.86***	-3.75***	0.86	1.96*	-1.93*	0.86
Industrial Goods and Services	3.75***	-3.67***	0.88	5.74***	-4.85***	0.87	5.4***	-3.09***	0.87
Insurance	-1.06	-1.08	0.80	-0.9	-1.08	0.82	0.34	-1.54	0.71
Media	-1.3	0.98	0.80	2.75***	-0.32	0.80	5.88***	-1.23	0.79
Personal & Hh goods *excl. Tobacco*	-1.46	-1.97*	0.77	-0.71	-2.01**	0.65	1.14	-1.99*	0.67
Personal and Household goods	-7.88***	-1.06	0.79	-6.38***	-1.16	0.70	-3.92***	-0.71	0.69
Retail	-9.03***	0.39	0.86	-5.14***	0.09	0.83	1.31	-0.18	0.76
Travel & Leisure	5.04***	-5.52***	0.87	8.75***	-6.57***	0.83	8.67***	-4.73***	0.61
Technology	-54.13***	3.29***	0.92	-0.79	0.75	0.92	-0.94	1.08	0.90
Telecommunication	0.86	-0.61	0.71	1.1	-0.76	0.80	6.21***	-0.78	0.75
Oil and Gas Industry	0.61	1.22	0.85	-12.37***	6.44***	0.52	3.74***	1.71*	0.86
Utilities	-3.79***	-0.98	0.92	-2.52**	0.32	0.92	-1.7*	1.19	0.91

10.16 ASSUMPTIONS UNDERLYING THE OLS REGRESSION

In order to perform the OLS regression we have to make a number of assumptions about our data. These assumptions are as follows according to Gujurati (2003):

1) Zero mean value of the error term ε_i, or equivalently $E(\varepsilon_i | X_{2i}, X_{3i}) = 0$ for all *i*
2) No serial correlation, or $\text{cov}(\varepsilon_i, \varepsilon_j) = 0 \quad i \neq j$
3) Homoskedasticity, or $\text{var}(\varepsilon_i) = \sigma^2$
4) Zero covariance between ε_i and each X variable, or $\text{cov}(\varepsilon_i, X_{2i}) = \text{cov}(\varepsilon_i, X_{2i}) = 0$
5) No specification bias, i.e. the model is correctly specified.
6) No perfect linear relationship between the X variables, i.e. no perfect multicollinearity.
7) The number of observations n must be grater than the number of parameters to be estimated.
8) The X values in a given sample must not all be the same, $|\text{var}(X)| > 0$
9) To draw statistical inferences, we must also assume that the error terms are *normally and independently distributed*, i.e. $\varepsilon_i \sim \text{NID}(0, \sigma^2)$

Given that these assumptions hold, the ordinary least square estimators have minimum variance. That is they are the best linear unbiased estimators ("BLUE").

10.17 AUTOCORRELATION

Table A13. Autocorrelation

This table shows the results from a Durbin – Watson alternative test for autocorrelation for each of our 15 OLS regressions in Table A10 in Appendix 10.13. For example, row [1] shows the test-statistic for the regressions when analyzing firms in the Basic Resources industry. Column [a] shows the results for the regressions using the P/E-multiple valuation. Thus the test statistic when regressing P/E-valuations for the Basic Resources industry is 11.540. The p-values show the lowest level of significance for which we can reject the null hypothesis of no autocorrelation. Generally, a number below 5% signals strong evidence of autocorrelation. chi² that can be rejected at 1% level of significance are indicated by "***", at 5% are indicated by "**", and at 10% indicated by "*".

	[a] P/E		[b] P/EBT		[c] EV/EBITDA	
	[1] test statistic, χ^2	[2] p-value	[1] χ^2	[2] p-value	[1] χ^2	[2] p-value
Basic Resources	11.540***	(0.001)	0.367 **	(0.016)	0.5448	(0.898)
Chemicals	1.356	(0.244)	3.231 *	(0.072)	2.674	(0.102)
Food & Beverage	14.453 ***	(0.000)	7.418 ***	(0.007)	8.474 ***	(0.004)
Industrial G & S *excl. Aero & Def*	0.288	(0.591)	0.07	(0.791)	0.476	(0.490)
Media	0.057	(0.811)	2.384	(0.123)	2.99*	(0.084)

10.18 MULTIPLE VALUATION LSDV REGRESSION FOR OUR FIVE MAIN INDUSTRIES

Table A14. Multiple valuation LSDV regression for our five main industries

In total, this table shows the results of 15 different LSDV regressions. Each was performed with the market cap. as the dependent variable. The columns [a]-[c] each represent a valuation using a different multiple. The column named "UK" shows the values for the slope dummy variable included in each regression. The rows [1] show the slope and the slope dummy, with its t-value within parenthesis below. The rows [2] is the coefficient for the constant, with the corresponding t-value within parenthesis below. The t-values that are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".The rows [3] present the r-squares for the regression. Figures are in millions.

	[a] P/E		[b] P/EBT		[c] EV/EBITDA	
	Rest of Europe	**UK**	**Rest of Europe**	**UK**	**Rest of Europe**	**UK**
Basic Resources						
[1] **Model value**	0.91***	-0.325**	0.881***	-0.492**	0.182***	-0.023
	(5.690)	-(2.010)	(3.95)	-(2.19)	8.24	-(1.040)
[2] **Constant**	2072.297***		3207.506***		1111.072***	
	(4.27)		(4.79)		(2.720)	
[3] **R²**	0.76		0.50		0.93	
	P/E		**P/EBT**		**EV/EBITDA**	
	Rest of Europe	**UK**	**Rest of Europe**	**UK**	**Rest of Europe**	**UK**
Chemicals						
[1] **Model value**	0.708***	0.336	0.493***	0.351*	0.089***	0.103
	(27.570)	(1.510)	(23.01)	(1.89)	18.83	(1.620)
[2] **Constant**	2060.015***		2997.675***		2113.611***	
	(9.77)		(14.72)		(6.690)	
[3] **R²**	0.7766		0.699		0.6763	
	P/E		**P/EBT**		**EV/EBITDA**	
	Rest of Europe	**UK**	**Rest of Europe**	**UK**	**Rest of Europe**	**UK**
Food & Beverage						
[1] **Model value**	0.867***	-0.202***	0.879***	-0.05	0.17***	-0.002
	(27.62)	-(2.91)	(28.47)	-(0.85)	(17.78)	-(0.1)
[2] **Constant**	3939.837***		3164.5***		1878.973***	
	(10.14)		(8.56)		(2.87)	
[3] **R²**	0.751		0.7821		0.6437	
	P/E		**P/EBT**		**P/EBTA**	
	Rest of Europe	**UK**	**Rest of Europe**	**UK**	**Rest of Europe**	**UK**
Industrial G & S *excl. Aero & Def*						
[1] **Model value**	0.693***	0.173**	0.659***	0.266***	0.698***	0.342***
	(45.400)	(2.470)	(43.99)	(4.09)	(36.85)	(4.56)
[2] **Constant**	1000.661***		928.245***		702.440***	
	(13.71)		(13.15)		(8.88)	
[3] **R²**	0.6582	8.7	0.6306	9.4	0.5925	8.4
	P/E		**P/EBT**		**EV/EBITDA**	
	Rest of Europe	**UK**	**Rest of Europe**	**UK**	**Rest of Europe**	**UK**
Media						
[1] **Model value**	0.659***	-0.235***	0.588***	0.12*	0.097***	0.01
	(21.690)	-(3.580)	(19.67)	(1.76)	10.51	(0.56)
[2] **Constant**	2280.129***		1869.575***		2188.37***	
	(12.24)		(9.71)		(7.590)	
[3] **R²**	0.5538		0.5347		0.5067	

10.19 MULTIPLE VALUATION LSDV REGRESSION

Table A15. Multiple valuation LSDV regression

In total, this table shows the results of 72 different LSDV regressions. Each was performed with the market cap. as the dependent variable. The columns [a]-[c] each represent valuations using different multiples. Column [1] and [2] present the t-value of the slope and slope dummy respectively. The t-values that indicate that the variables are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".The column [3] present the r-square for the regression.

	[a] P/E		[b] P/EBT		[c] EV/EBITDA	
	[1] t-value	[2] R^2	[1] t-value	[2] R^2	[1] t-value	[2] R^2
Automobil and Parts	0.96	0.62	1.06	0.83	1.85*	0.62
Banks	1.98*	0.84	1.57	0.86	-9***	0.57
Basic Resources	-2.01**	0.76	-2.19**	0.50	-1.04	0.93
Chemicals	1.51	0.78	1.89*	0.70	1.62	0.68
Construction and materials	0.11	0.82	2.28**	0.81	1.76*	0.19
Financial Services	-6.75***	0.63	13.81***	0.26	5.35***	0.47
Financial Services *only General Finance*	-1.53	0.51	12.11***	0.36	6.8***	0.36
Financial Services *only Real Estate*	-9.66***	0.62	6.44***	0.18	4.12***	0.33
Food & Beverage	-2.91***	0.75	-0.85	0.78	-0.1	0.64
Health care	-7.99***	0.65	-7.35***	0.68	-11.7***	0.73
Health care *only Pharmaceutical & Bio*	-5.91***	0.65	-5.39***	0.67	-8.66***	0.71
Health care *only Equipment & Services*	1.06	0.80	3.12***	0.71	2.29**	0.64
Industrial G & S *excl. Aero & Def*	2.47**	0.66	4.09***	0.63	1.9*	0.61
Industrial Goods and Services	2.9***	0.68	5.74***	0.66	4.11***	0.63
Insurance	-1.36	0.54	0.69	0.53	0.71	0.17
Media	-3.58***	0.55	1.76*	0.53	0.56	0.51
Personal & Hh goods *excl. Tobacco*	1.17	0.46	2.11**	0.39	4.18***	0.49
Personal and Household goods	1.96*	0.57	4.5***	0.53	6.18***	0.62
Retail	0.33	0.20	1.59	0.53	3.84***	0.36
Travel & Leisure	3.54***	0.80	6.35***	0.77	8.11***	0.45
Technology	-35.9***	0.79	-0.43	0.78	-0.53	0.75
Telecommunication	2.81***	0.48	2.34**	0.64	2.43**	0.35
Oil and Gas Industry	1.1	0.55	-10.76***	0.34	-3.08***	0.63
Utilities	-2.66***	0.85	-1.91*	0.85	-5.12***	0.76

10.20 "LAW AND FINANCE" EFFECT ON OUR FIVE INDUSTRIES OF FOCUS

Table A16. OLS regression including "anti-director" indices

This table provides the results of an OLS regression for our 5 main industries. The result show the coefficients for the multiples when regressed against "anti-director" indices, while controlling for ROIC and growth. Columns [1]-[3] each represent the indices produced by an author or group of authors, namely LLSV (1998), Spamann (2006) and Djankov et al. (2005). t-values are shown in the parentheses. The coefficients that are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".

	EV/EBITDA		
	[1]	[2]	[3]
	LLSV	**Spamann**	**Djankov**
Basic resources	0.853***	0.266	1.636***
	(5.32)	(0.39)	(4.58)
Chemicals	0.234**	-0.075	0.079
	(2.39)	-(0.4)	(0.4)
Food & Beverage	0.306**	-0.081	0.548**
	(2.42)	-(0.27)	(2.56)
Industrial G & S *excl. Aero. & Def.*	0.235**	0.343	0.283*
	(2.51)	(1.45)	(1.66)
Media	0.668***	-0.64	0.752**
	(2.89)	-(1.63)	(2.14)

Table A17. Augmented Dickey Fuller test

The table shows the results of an augmented Dickey Fuller test for a unit root. The null hypothesis is that we have non-stationary data, i.e. a unit root. If z_{obs} is large, we can reject the null hypothesis, which indicates that we have stationary data. p-values are shown in the parentheses. The unit roots that can be rejected at 1% level of significance are indicated by "***", at 5% are indicated by "**", and at 10% indicated by "*".

	[a] P/E		[b] P/EBT		[c] EV/EBITDA		[d] MCAP	
	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]
	test statistic, z_{obs}	**p-value**	**z_{obs}**	**p-value**	**z_{obs}**	**p-value**	**z_{obs}**	**p-value**
Basic resources	-9.908 ***	(0.000)	-11.711 ***	0.000	-10.561***	(0.000)	-21.746***	(0.000)
Chemicals	-10.892 ***	(0.000)	-11.827***	0.000	-10.337 ***	(0.000)	-11.241***	(0.000)
Food & Beverage	-18.368***	(0.000)	-16.730 ***	0.000	-15.498***	(0.000)	-16.843***	(0.000)
Industrial G & S *excl. Aera & Def*	-37.562***	(0.000)	-39.215 ***	0.000	-37.313 ***	(0.000)	-35.634***	(0.000)
Media	-18.354***	(0.000)	-20.035 ***	0.000	-18.931 ***	(0.000)	-21.139 ***	(0.000)

10.22 THE DIFFERENCES BETWEEN THE LSDV AND THE GLS REGRESSIONS

The general assumptions underlying a panel data regression are rather technical and can be found in any statistics textbook such as Gujurati (2003). However, the use of panel data assumes that we have an unobserved effect present in our sample. This critical assumption has to be based on economic reasoning. Furthermore, the technical assumptions necessary for the fixed effects, or LDSV, regression are generally the same as those underlying the random effects, or GLS regression. The crucial difference between the two concerns the assumptions we make about the unobserved effect and the error term in the regression. To see this consider the general regression model underlying the panel data regressions:

$$Y_i^t = \beta_1 \cdot X_{1,i}^t + ... + \beta_m \cdot X_{m,i}^t + \gamma_i + \varepsilon_i^t$$

Where Y_i^t is the dependent variable for firm *i* in year *t* (e.g. market capitalization)

X_{1i}^t is the explanatory variable 1 for firm *i* in year *t* (e.g. modelvalue from the Multiple valuation)

X_{mi}^t is the explanatory variable *m* for firm *i* in year *t* (out of a total of *m* explanatory variables)

γ_i is the unobserved effect (e.g. firm characteristics)

ε_i^t is the error term

The main difference between the LSDV regression and the GLS regression stems from the fact that the latter assumes that the error term ε_i^t is uncorrelated with the explanatory variables X_{1i}^t to X_{mi}^t. Mathematically:

The LSDV and GLS both assume:

$E\left(\varepsilon_i^t \mid X_{j,i}^t, \gamma_i\right) = 0$ assumption (1)

But the GLS additionally assumes that:

$E\left(\gamma_i \mid X_{j,i}^t\right) = 0$ assumption (2)

for every j = 1, 2, …, m.

Which if it holds makes the GLS approach more efficient than the LSDV regression. However, if assumption (2) does not hold, we have to use the LSDV approach. This is why the GLS can be seen as a special case of the LSDV regression, which only holds given more strict assumptions (which can be tested using the Hausman test).

10.23 HAUSMAN TEST

Table A18. Hausman Test

This table provides an overview of the results of the Hausman test. It tests the applicability of a random effects, GLS regression (in stead of the LSDV regression). We performed the Hausman test for our three variables (Columns [a]-[c]). Colums [1] present the chi² of the test and column [2] the corresponding p-values. The chi²s that are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*". Column [3] indicates which regression one should use based on the Hausman test. For our analysis, only the EV/EBITDA for Industrial Goods & Services excl. Aerospace could have been performed with the Random Effect regression.

	[a] P/E			[b] P/EBT			[c] EV/EBITDA		
	[1] chi²	[2] p-value	[3] Result	[1] chi²	[2] p-value	[3] Result	[1] chi²	[2] p-value	[3] Result
Basic resources	1696.29***	(0.000)	FE	360.16***	(0.000)	FE	-	-	-
Chemicals	161.51***	(0.000)	FE	3451.18***	(0.000)	FE	36.96***	(0.000)	FE
Food & Beverage	206.06***	(0.000)	FE	185.74***	(0.000)	FE	25.39***	(0.000)	FE
Industrial G & S *excl. Aero & Def*	77.67***	(0.000)	FE	35.15***	(0.000)	FE	1.79	(0.409)	RE
Media	115.18***	(0.000)	FE	39.77***	(0.000)	FE	8.43**	(0.015)	FE

10.24 MULTIPLE VALUATION LSDV REGRESSION – CONTROLLING FOR ROIC & GROWTH

Table A19. Multiple valuation LSDV regression when controlling for ROIC and Growth

This table shows the results of different LSDV regressions for our 5 main industries when controlling for ROIC and growth. Each was performed with the market cap. as the dependent variable. The columns [a]-[c] each represent valuations using different multiples. Column [1] and [2] present the t-value of the slope and slope dummy respectively. The t-values that indicate that the variables are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".The column [3] present the r-square for the regression.

	[a] P/E		[b] P/EBT		[c] EV/EBITDA	
	[1] t-value	[2] R^2	[1] t-value	[2] R^2	[1] t-value	[2] R^2
Basic Resources	2.09**	0.82	2.11**	0.50	1.02	0.92
Chemicals	2.17**	0.70	1.54	0.64	0.93	0.59
Food & Beverage	-3.46***	0.66	-1.99*	0.69	0.14	0.53
Industrial G & S *excl. Aero & Def*	2.62***	0.91	3.52***	0.88	1.16	0.88
Media	-3.88***	0.58	0.81	0.53	-0.31	0.35

10.25 MULTIPLE VALUATION LSDV REGRESSION – ONLY LOW GROWTH FIRMS

Table A20. Multiple valuation LSDV regression - only firms with maximum 3% growth

This table shows the results of different LSDV regressions of firms with maximum 3% growth. Each was performed with the market cap. as the dependent variable. The columns [a]-[c] each represent valuations using different multiples. Column [1] and [2] present the t-value of the slope and slope dummy respectively. The t-values that indicate that the variables are siginificant at 1% level are indicated by "***", at 5% by "**", and at 10% by "*".The column [3] present the r-square for the regression.

	[a] P/E		[b] P/EBT		[c] EV/EBITDA	
	[1] t-value	[2] R^2	[1] t-value	[2] R^2	[1] t-value	[2] R^2
Basic Resources	-1.38	0.82	-1.28	0.70	0.81	0.84
Chemicals	0.1	0.64	0.82	0.67	0.29	0.42
Food & Beverage	-3.99***	0.44	-1.62	0.55	-1.09	0.71
Industrial G & S *excl. Aero & Def*	1.05	0.45	2.7***	0.43	1.89*	0.23
Media	-1.97*	0.24	0.52	0.09	-0.29	0.15