Intangibles Investments and Accounting Numbers Usefulness : an Empirical Study of the European Stock Market

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Intangibles, Accounting Numbers and Financial Reporting: Usefulness, Informativeness and Relevance on the European Stock Markets

Abstract:

Motivated by the recent works by Lev [2001b ; 2004] and Villalonga [2004], and the current debate surrounding the international financial reporting standard n°38 (i.e. IAS 38) adoption related to reported intangible investment issues, this study investigates whether European firms using national generally accounting principles (hereafter, GAAP) exhibit differences while considering the relationship between firm performance and reported intangible investment.

Using a four-representative-European-country (i.e. France, Germany, Spain and U.K.) dynamic data panel, we investigate whether intangible accounting numbers in these different settings can be significantly linked, during the period 1993-2003, to the following firm performance triptych: financial, operational and competitive performance. Reported intangible investment is measured herein by three accounting proxies: the change in goodwill stock [*see* Griliches, 1981], the change in reported intangible assets stock [*see* Hall, 2000] and the research and development (R&D) expenditures.

JEL Classification : G31 ; M21 ; M41

Keywords : Intangible investments, intangible assets, goodwill, accounting numbers, financial reporting, informativeness, usefulness, relevance.

1. Introduction

According to the fundamental precepts of financial modern theory, in any competitive setting, the market value of a firm's equities is equal at margin to the value of all the firm net assets minus its liabilities. As soon as most of the firm assets are physicals such as plants, properties and equipments, the observed relationship between assets value and stock price may be considered as being relatively straightforward [Beaver, 1981]. However, in new knowledge-based economy, the market value of a company chiefly reflects its intangible assets like brands, patents, reputation and organizational capital. Facing growing-up intangible flows[1], traditional accounting frameworks relying on the "classical transactional principle" henceforth fail to fully complete its assigned informative role in any decision making process[2] [Lev, 2001a]. Thus, whether considering U.S., U.K., Spanish, German or French Generally Accepted Accounting Principes (hereafter, GAAP), intangible assets are partially and inaccurately reported into the financial reports. This latter statement reminds that national accounting standard setters tend to make the "accurate information" principle prevail at the cost of the "relevant information" principle [Cañibano, García-Ayuso & Sanchez, 2000]. As a result, accounting information as contained in financial reports does not provide anymore, on its sole basis, users with any clear relationship between accounting and market values [Ohlson, 1995].

Meanwhile, authors [e.g. Hand & Lev, 2004; Henning, Lewis & Shaw, 2000] widely claim that intangible assets are increasingly becoming the major drivers of firm value and performance in most economic sectors, but the benefits, whether financial, operational or competitive, from reporting these assets has eluded so far investors, managers, accountants, and financial analysts.

In this respect, the intangible valuation process turns out to be longer and more complex and so does the equities valuation techniques of firms widely investing in such assets. Nevertheless, numerous authors [e.g. Sougiannis, 1994; Lev & Zarowin, 1998; Lev, 2004; Villalonga, 2004] keep on arguing that accounting indicators for

intangible investments are still useful, informative and value-relevant[3]. This is precisely the triple hypothesis we propose to test in this paper.

The empirical approach followed in our study is not innovative on its own. Indeed, since the seminal works of Griliches [1981] and Cockburn & Griliches [1988] which document the links between firm market value and its intangible assets value, a large academic drift has progressively been developed[4]. The bundle of theoretical and empirical studies brought around by this academic trend has allowed for more understanding and showed out self-conclusive evidence on the impact of intangible investment on firm performance. However, from these researches, two limitations could be roughly outlined. Firstly, most of these studies are mainly concerned with the impact of intangible investments as proxied by research & development (hereafter R&D) expenditures (e.g. Sougiannis [1994] ; Lev & Zarowin [1998]; Chan, Lakonishok & Sougiannis [2001]; Cazavan-Jeny & Jeanjean [2006]) or firm patents (e.g. Griliches [1981] ; Cockburn & Griliches [1988]) on stock prices. As a consequence, other key intangible accounting items such as reported intangible assets and goodwill are eluded from the scope of most of these empirical studies. Secondly, these empirical studies principally focus on samples made of U.S. listed companies. Following this, the results discussed and the relationships documented by previous researches appear to be hardly conveyable to other accounting and financial settings such as the European countries environment because of the divergences observable amongst national accounting standard frameworks[5].

Motivated by these two considerations, and the current debate surrounding the international financial reporting standard n°38 (i.e. IAS 38) adoption related to reported intangible investment issues, this paper investigates whether European firms using national generally accounting principles (hereafter, GAAP) exhibit differences while considering the relationship between firm performance and reported intangible investment.

Using a four-representative-European-country (i.e. France, Germany, Spain and U.K.) dynamic data panel, we investigate whether intangible accounting numbers in these different settings can be significantly linked, during the period 1993-2003, to the following performance triptych: financial, operational and competitive performance. Reported intangible investment is measured herein by three accounting proxies: the change in goodwill stock, the change in reported intangible assets stock and the research and development (R&D) expenditures. Besides, both measures of stock are based on the Griliches' [1981] perpetual inventory equation.

Assuming UK GAAPs intangible requirements are the closest to the IFRS setting, we examine independently each national accounting design and gauge their differences in terms of firm performance regarding the UK framework as a sensible benchmark. Our results tend then to get ascribed in the current debate surrounding IASB standards issues about intangible assets reporting.

Based on the accounting valuation setting widely documented by Sougiannis (1994) and Lev & Sougiannis (1996), our findings bring us towards the following three concerns:

(1) Firstly, in any stock market under scope, we do find clear evidence that while constructing their investment portfolios investors adopt a short-term perspective or "myopic view" by precluding firms from reporting high intangible investment in their financial statements.

(2) Secondly, regardless the national GAAP under consideration, we do not find any evidence that reported intangible investments underpin a better competitive position inside a specific market. We conclude that relationship between reported intangibles and the firms' competitive advantage should not be held constant in future research designs.

(3) Finally, our results clearly support the idea that Latin accounting frameworks, while opposed to UK settings and subsequently to International disposals, ease the relationship recognition occurring between intangibles and the firm operational

performance. This last result would suggest that IAS implementation could lead to disconnect progressively operational margins from reported intangibles as their valuations are, under IFRS, overall market-oriented. As a consequence, this latter finding would not support widespread claims that IAS produce financial statements of higher informational quality about the firms' operational activities.

The remainder of the paper is organized as follows. The following section discusses the main results provided by the academic literature regarding the intangible assets valuation issues and their impacts on firm performance. Section 3 describes our research methodology, the adopted econometric modelling procedure and its underlying hypotheses. The data collection method with its selection criteria are then exhibited in section 4. Section 5 presents and then discusses the univariate and multivariate results of our analysis. Some tests of robustness and sensitivity are then conducted in section 6. Finally, as a conclusion, section 7 provides a summary of the paper's main results and draws out some future research avenues.

2. Theoretical and empirical framework, and local standard-setting

In this section, we first start by briefly presenting the previous work studying the link between intangible investments and firm financial performance. We then discuss the results related to accounting information relevance in terms of intangible investments while making a difference amongst financial performance, operational performance and competitive performance.

2.1. "Intangible value-relevance studies": a stand-alone academic drift

During the last two decades, empirical studies have attempted to find evidence that investment in intangibles (often roughly assimilated to R&D expenses or advertising expenditures) do increase significantly the firm's future performance and subsequently are positively correlated to firm market value.

Originally, this academic drift was initiated by American researchers whose main objective was to prove to the US FASB (Financial Accounting Standards Board) that R&D and other investments were linked to additional firm performance and consequently that they should be capitalized on a firm's balance sheet [Cañibano *et al.*, 2000]. However, since the first studies (see for example, Johnston [1967]) did not turn out to be successful while conducting such an attempt, the FASB issued in 1974 the Statement n°2 which simply prohibits the capitalization of R&D expenditures. Bringing later more conclusive evidence, recent studies have managed to partly fill the gap separating additional future profitability from investments in R&D [e.g. Sougiannis, 1994 ; Lev & Sougiannis, 1996 ; Lev & Zarowin, 1998] or advertising expenses [Bublitz & Ettredge, 1989 ; Chauvin & Hirschey, 1993]. Nonetheless, it is important to note that the concept of "future profitability" may vary from one research to another one. Crossing over the different studies' results happens therefore to be of much complexity. However, focusing on previous studies' research design, two categories of researches can be figured out: on the one hand, studies analyzing the relationships occurring between share return and investments in intangible assets and, on the other hand, research works dealing with relationships between operating income and intangible investments. To these two classes, it is also possible to add another category based on the "resource-based view" of the firm. This last category of studies tends to shed light on the potential link between competitive advantage/disadvantage and the intangible resources of the firm [e.g. Villalonga, 2004].

2.2. Share return and intangible investment

The relationship between share return and the increase in R&D expenditures have been widely documented after Grabowski & Mueller [1978] suggest that firms evolving in intensive research environment exhibit on average greater stock returns. Adopting a more financial perspective, Morck & Yeung [1991], stepping Hirschey's

[1982] work, report that, on average, R&D and advertising expenditures impact positively and significantly a firm's market value.

Maybe one of the most innovative studies in this field remains the work conducted by Sougiannis in 1994. Proposing an approach based on the Ohlson's [1990; 1995] model framework, Sougiannis [1994] brings clear evidence that R&D expenditures are positively related to firm profit over a seven-year period. Sougiannis then suggest that investment in R&D can help increase future performance and market value as this last one is just the present value of the firm's future performances. Enhancing this idea, Lev & Sougiannis [1996] and Lev & Zarowin [1998] observe a significant intertemporal relationship between R&D capital and future share return, suggesting that a valuation bias may occur for stock prices of companies involved in intensive R&D investments because of an additional risk factor attributable to this activity. Similarly, Chan *et al.* [2001] bring evidence that US listed firms involved in high R&D expenditures to market value ratio tend to exhibit weak past share returns and signs of mispricing. This last result would suggest that the market does not manage to remunerate fairly companies for their R&D investments.

However, contrary to their predecessors, these authors [Sougiannis, 1994 ; Lev & Sougiannis, 1996], Chan *et al.* [2001] do not find out any clear relationship between R&D expenditures level and future share returns.

Moreover, the significance of R&D variables in the models tested by this literature varies considerably from one study to another one. In this respect, Lev [2004] suggests that this significance variation could be explained by the different methods used to approximate share returns.

2.3. Production costs and intangible investments

In a recent study, Nakamura [2001; 2004] observes that investments in R&D made by private US companies have increased from 20 billions of USD up to 180 billions of dollars over the period 1977-2000 while production costs as a percentage of firm to

total sales, during the same period, have substantially diminished on average by 12,5% passing from 66% down to 53.5% as shown in Exhibit 1. Nakamura [2001] then suggests that an investment in intangibles sustained during at least five years could make the firm's operational margins increase on average.

Insert EXIBIT 1 ABOUT HERE

These findings coupled with the ones provided earlier by Lev & Sougiannis [1996] and Lev & Zarowin [1998] would lead to suggest that the intrinsic value of R&D expenditures as these latter ones are investments realized by firms in order to increase their future operating income measures would simply equal the present value of additional future operating income generated by these investments. Accordingly, Sougiannis [1994] observes that R&D expenditures impact positively and significantly the firm operating income over at least 7 financial periods. This result brought inspiration to the « resources-based view » authors who started to suggest that intangible assets are a firm's independent resource as any physical asset and subsequently can be directly related to firm competitive advantage / disadvantage.

2.4. Intangible resources and competitive advantage / disadvantage

Some recent studies have opted for the "resource-based view" (RBV) [*see* Itami, 1987] as research design suggesting that operating benefits persistence (often assimilated to operating income), the firm specific profit (defined conventionally as the difference between the firm's profitability and the average profitability of the industry in any given year) and the intangible investments are interrelated. In a study based on 1,992 US listed companies, during the period 1981-1997, Villalonga [2004] brings evidence that intangible resources[6] might be positively linked to the firm specific profit / loss persistence. This result would bring support to the RBV hypothesis saying that intangible assets play a key role in sustaining a firm's

competitive advantage / disadvantage. Following this, Villalonga [2004] concludes that from a strategic point of view, intangibles appear to be a double-edged sword and in this respect meet the RBV theory expectations. This argument saying that intangibles could have a negative impact on firm's competitive position has been shyly documented in the accounting literature [for a discussion on this point, *see* Lev & Zarowin, 1998].

As a summary, previous studies tend to present ambiguous results on the impact of intangible investments on firm performance. On one side, intangible investments seem to be positively related to share returns over a 5 to 7-year period [Sougiannis, 1994 ; Lev & Sougiannis, 1996 ; Lev & Zarowin, 1998]. On the other side, it is worth noting that some studies [e.g. Chan *et al.*, 2001] still do not find any conclusive results. Besides, operational profit as proxied by the operating income to total sales ratio seem to be positively related to R&D expenses on a long-run perspective [Sougiannis, 1994 ; Lev & Zarowin, 1998 ; Nakamura, 2001]. Finally, "resource-based" researches [e.g. Villalonga, 2004] bring support to the idea that firm intangible resources impact a firm's competitive advantage / disadvantage.
These different considerations form the starting point of our investigation process.

2.5. Intangible in the local standard-setting

In IAS 38, the recognition of intangible is founded on two conditions :

- Legal or contractual right;
- Identifiable asset that will generate expected future economic benefits.

The intangibles with definite lives must be amortized and have a depreciation test on any indications. The intangibles with indefinite lives must only have a systematic annual depreciation test. Thus, IAS 38 don't recognize market share and portfolio customer and under 6 conditions the R&D must be capitalized.

Around the world all domestic GAAP recognize purchased (like brands, patent licences, goodwill[1]…) and internally generated intangibles (like R&D expenses, portfolios customers…) with various capitalization conditions.

In France the authority of the normalization, the CNC and the CRC have decided officially not to extend permission to use IFRS in financial reporting by individual, but since December 20th 2004, all companies can apply IFRS in their consolided financial reporting. In practice, France adopted a convergence strategy between French gaap and IFRS on main topics. For internally generated intangibles, French companies can recognize on asset market share, portfolio customer without amortization (CRC 99-03). The capitalization of development costs is an optional but preferred method for development costs (CRC 2004-06). According to CRC 2004-06 all intangibles purchased are recognised on the asset because founded on contractual right and a separate acquisition. In a business acquisition this intangibles are never incorporated in goodwill. The goodwill can be recognized on the purchase method (CRC 99-02) like IFRS 3. After the acquisition, the goodwill must be amortized with an impairment test based on any indications of depreciation.

The Germans companies must prepare financial statement under IFRS or german group like France. IFRS's is allowed for individual statement if financial statement is prepared according to tax rules (HGB (Handelsgesetzbuch, Commercial Code)).

In Germany there's not legal definition of intangibles asset. In Germany, the recognition of internally generated intangible is impossible because the measurement is not reliable enough for German's GAAP. The R&D expenses (for the development costs) can't be recognized on asset and the capitalization of internally generated brand is impossible (MarkenG, brands act of October 25, 1994). Intangible assets acquired can be recognized on asset and amortized on their useful life. The amortization required generally over 3-5 years, limited possibility over 20 years. The goodwill must be amortized on 15 years period and never more (HGB § 268).

[1] Difference between the cost of the business combination and the acquirer's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities so recognised.

The differences between UK gaap and IFRS are small because ASB (Accounting Standards Board) follows a systematic converging accounting standards with IFRS policy. The development expenses can be recognized on asset. The brands can be recognized on asset with amortization but a systematic depreciation test on each period without amortization is preferred. Intangibles acquired are recognised on the asset because founded on contractual right like IAS 38. To reach harmonization with IFRS, the goodwill must be capitalized with amortization (FRS 12). According to CA 1985 (Companies Act), all intangibles assets (internally generated and purchased) must be amortized on useful life. The intangible assets with indefinite lives can be amortized.

Italy has adopted a convergence between Italy Gaap and IFRS. The individual financial statement can adopted IFRS. The Development costs, advertising costs, preliminary expenses can be capitalized under conditions with an amortization on 5 years. The brands internally generated must not be capitalized. Intangibles acquired are recognised on the asset because founded on contractual right like IAS 38. The goodwill may be recognize on asset and amortized on 5 years or more.

In Spain, the « décret royal 743/1990 » of the december 20th 1990 and the law of 1989 have changed the Plan of Contabilidad General of 1970. The capitalization of R&D is limited but harmonized with IAS 38. The goodwill must be amortized on 10 years and never more. Internally generated intangibles are capitalized on many restrictions. It's impossible in practice. The goodwill must be recognized on asset with an amortization on 5 or more 10 years limited. All other intangibles acquired must be capitalized and amortized.

3. Research design and hypotheses development

Our research design tends to study the impact of intangible investment under the following triptych: firm financial performance (3.2), firm operation performance (3.3) and firm competitive performance (3.4). These three models are exhibited and discussed in this section and are all based on the perpetual inventory equation as proposed by Griliches [1981].

3.1. Application of the perpetual inventory equation to intangible investments

Previous studies analyzing the relationship between firm performance and intangible assets are based either on stock measures, or on flow measures (e.g. R&D expenditures) or on both [see for instance, Villalonga, 2004]. In order to avoid the problem of multicollinearity evoked by Schankerman [1981], the stock measures originally by Griliches [1981] and reformulated later by Hall [2001] are used. These measures are built not only for the total of intangible assets as reported in a firm's balance sheet but also for the reported goodwill whether purchased or internally developed[7]. We then assume that the perpetual inventory equation takes the following form:

$$K_t = (1-\delta) * K_{t-1} + I_t \qquad (1)$$

where

K_t stands for the quantity (or stock) of intangible investments reported by the firm at the end of the period t

δ is the depreciation rate of intangible investments[8]

I_t stands for the intangible investments realised by the firm during the period t.

This equation allows us to build on the intangible investments variables used all over our research design. However, one remark has to be made concerning the rate of depreciation used in the equation. Indeed, as stated by Lev & Zarowin [1998], the periodical depreciation rate in the perpetual inventory equation is highly subjective and accordingly limits the modelling scope. However, Hall [2001; 1990] asserts that

the choice made upon this depreciation rate does not influence significantly the results as far as the rate stays into the interval [5% ;20%].

3.2. Financial performance model

This first model based on Lev & Zarowin's [1998] approach estimates the response coefficient of intangible investments from the following regression of stock returns on earnings and intangible outlays[9]:

$$R_{jt} = \gamma_0 + \gamma_{1*}(EPS_{jt} + I_{jt}) / P_{jt-1} + \gamma_{2*}(I_{jt} / P_{jt-1}) + \varepsilon_{jt} \qquad (2)$$

where

P_{jt}	is the firm j 's share price (i.e. total price index) at the end of the period t
R_{jt}	is the firm j 's share return (i.e. total return index) at the end of the period t
EPS_{jt}	stands for the earning (i.e. operating income) per share of the firm j at the end of the period t
I_{jt}	is the intangible investment per share of the firm j at the end of the period t.

Three remarks have to be made regarding this model. Firstly, following Ohlson & Penman [1992], we use the level of financial variables as regressors. We do not use change in variables as explanatory variables in order to avoid loosing one year-observation (as the number of observations per firm is only of 10[10]). Secondly, using a variation as an endogenous variable, i.e. share return, prevents the model from the omitted variable bias [Heckman, 1978] and the firm-specific effect [Anderson & Hsiao, 1982]. Ultimately, following Lev & Zarowin [1998], it is worth noting that the coefficient γ_1 is well known as the "earning response coefficient" in the financial accounting literature while γ_2 could be named, by analogy, the "intangible investment response coefficient". In other words, γ_1 reflects the impact of a one-monetary-unit increase in operating income on the price return index whereas γ_2 similarly indicates the impact of one-monetary-unit invested in intangibles on the stock price.

3.3. Operational performance model

The second model tested in this paper is inspired from Nakamura's [2001] and Lev's [2001b ; 2004] works. In his intangibles' valuation model[11], Lev [2001b ; 2004] assumes that a firm generates economic profits[12] with the use of two main components: its physical capital and its intangible capital. According to this author, a firm's physical capital can generate a predetermined amount of future benefits (whatever the firm is). Accordingly, this is its intangible capital that makes the firm generate abnormal benefits[13]. This binary perspective appears to be close to the one developed earlier by Mortensen, Eustace & Lannoo [1997]. According to them, the intangible capital of a company would be revealed indirectly by the firm's additional economic performances that are not related to intangible investments. As underlined in the previous section, this hypothesis happens to be quite similar to the one discussed by Nakamura [2001].

Indeed, adopting a more macroeconomic point of view, Nakamura [2001] suggests that if a firm invests a substantial part of its resources into intangible assets, it should be able, if done efficiently, to reduce significantly its production costs on the long run and/or increase any kind of operational margins / mark-ups. Transposing this argument into a microeconomic perspective, this last hypothesis would suggest that operating income as a percentage of total sales should be impacted not only by present but also by past intangible investments.

Empirical studies tend to show that 5 to 7 lags of R&D expenses can be significantly related to firm performance (Sougiannis [1994] ; Lev & Sougiannis [1996] ; Lev & Zarowin [1998]]. Consistent with these findings, the following model is formulated:

$$OI_{jt} / CA_{jt} = \alpha_0 + \alpha_{1*}(TA_j / CA_j)_{t-1} + \sum_{k=1}^{5} \beta_{k*}(I_j / CA_j)_{t-k} + \varepsilon_{jt} \qquad (4)$$

where

OI_{jt}	stands for the operating income of the firm j at the end of the period t
$SALES_{jt}$	is the firm j's total sales as reported at the end of the period t
TA_{jt}	is the firm j's total assets as reported at the end of the period t

I_{jt} is the intangible investment per share of the firm j as reported at the end of the period t.

Regarding this model, it is important to note that: firstly, the sum of all coefficients β (i.e. $\Sigma\beta_k$) represents the impact of a one-monetary unit invested in intangibles on the firm's operating income through potential decrease of production costs. This sum allows then to quantify the impact of intangible investments on firm operation profit[14]; secondly, this model exhibit an empirical weakness as the variables I_{jt} appear to be stable over financial periods. In order to avoid any multicollinearity issues, an Almon's [1965] polynomial transform is used[15].

3.4. Competitive performance model

This third model proposes to formalise the impact of the intangible investment on the competitive advantage as proxied by the end of period firm market share in its specific economic sector[16]. Following Nakamura's [2001] and Villalonga's [2004] studies, we hypothesize that intangible investments should help the firm keep or increase its market shares. Besides, according to Ulrich & Smallwood [2004]'s work on organizational capital, we introduce into the modelling process the exogenous variable, $\ln(EMPLO_{jt})$, which represents the labour force[17]. In order to alleviate the omitted variable bias [Heckman, 1978], the number of the firm's competitors is also included into the model as an explicative variable. We then obtain the following formulation: (5)

$$SALES_{jt} / (\sum_{k=1}^{N} SALES_{kt}) = \alpha_0 + \alpha_{1*} \ln(EMPLO_{jt}) + \alpha_{2*} \ln(COMP_{jt}) + \sum_{k=1}^{5} \beta_{k*} (I_j / SALES_j)_{t-k} + \varepsilon_{jt}$$

where

$SALES_{jt}$ is the end-of-period firm j 's total sales

$\ln(EMPLO_{jt})$ is the natural logarithm of the end-of-period firm j 's number of employees

$\ln(COMP_{jt})$ is the natural logarithm of the end-of-period firm j 's number of competitors within a two-digit SIC industry ;

I_{jt} is the intangible investment per share of the firm j at the end of the period t.

4. Data collection and sample selection criteria

A four-country sample was employed in this study. Initially, all the observations available under Compustat and DataStream for the period 1993-2003 and related to listed firms on the Paris, Madrid, Francfort and London stock exchanges were collected. Accounting variables are obtained from Compustat while financial variables are collected from DataStream.

The following selection criteria are then applied to the original data panel:

(1) Classically, financial and utility companies whose SIC code spread between 6000 and 6999 (financial institutions), and between 9100 and 9999 (government and non classifiable companies) are excluded from the sample.

(2) Authors such as Morck & Yeung [1991] and Jensen [1993] currently underline the fact that R&D variables suffer from a lack of information in traditional databases (e.g. DataStream and Compustat). Many "data-construction" procedures[18] have then been proposed by researchers to avoid small sample issues due to this lack of information. In this study, we choose to deal with missing data issues by using the Hall [1990] procedure implemented during the NBER Manufacturing Sector Master File elaboration. This procedure turns out to be useful in a R&D context as it allows implementing a simple interpolation method coupled with the perpetual inventory equation as originally proposed by Griliches [1981][19].

(3) In order to implement model (5) concerning the firm competitive advantage / disadvantage, unique observation within a two-digit SIC industry are deleted away.

(4) Finally, return or (scaled) operating income or (scaled) EPS or intangible investments observation in the top or bottom 5% of the pooled distribution are excluded from the analysis.

This sample selection process lead us to a French, Spanish, U.K. and German samples of respectively 551, 115, 1 080 and 485 observations, i.e. a final sample containing 2231 European listed-firms.

Table 1 presents a breakdown of the samples by one-digit-SIC-industry code and by year. From Table 1, our analysis suggests that our samples are fairly evenly distributed by year. The same table shows that both samples are fairly evenly distributed within most industries, except in [(3) Manufacturing, (7) Lodging & entertainment] for the French sample, [(2) Food, textile & chemicals, (3) Manufacturing, (4) Transportation] for the Spanish sample, [(2) Food, textile & chemicals, (3) Manufacturing, (7) Lodging & entertainment] for the U.K. sample and [(3) Manufacturing, (7) Lodging & entertainment] for the Germany sample. Further analysis and robustness tests will be then conducted in section 6 in order to examine the impact of these industrial overrepresentations.

Insert TABLE 1 ABOUT HERE

5. Empirical results

In this section, univariate (5.1) and multivariate (5.2) statistics are presented and then discussed.

5.1. Univariate statistics and Pearson correlations

Table 2 exhibits univariate statistics about the financial and accounting variables under analysis. These statistics are presented by country and by five-year period. Various descriptive statistics need to be discussed. First of all, it is important to note that the Mann-Whitney-Wilcoxon test is statistically significant for most of the country-variables (except for the RND to Sales ratio in France and the Operating Income to Sales ratio in Spain) suggesting the presence of a periodical effect. In this respect, further robustness checks will be conducted in section 6.

Secondly, reminding that European stock markets went through major financial crisis during the period 1998-2003 (e.g. the Asian financial crisis in 1997-1998 and the Internet financial crisis in 1999-2000), we then could explain the statistical difference on average (median) concerning share return (i.e. RET) observed between the two five-year periods: difference between the two periods for France, -15,71 % (-7.22%), Spain, -18,47% (-12,50%), the U.K., -10.76% (-6.67%) and Germany, -25,81% (-13,09%).

Thirdly, it may be interesting to note that intangibles as a proportion of total assets have substantially and significantly increased in all the countries samples between the periods 1993-1997 and 1998-2003 suggesting that either accounting recognize more this type of assets [Lev, 2004] and/or firms increase their use in the production process [Nakamura, 2001].

Fourthly, goodwill as a percentage of total assets is much higher on average (median) in France with 7.41% (3.30%) than in Spain with 2.82% (0.56%), in the U.K. with 5.35% (0.00%) or in Germany with 5.34% (0.95%). This last result could be explained by the difference existing amongst the four national standard frameworks. As an example, in the UK sample, the change in the percentage of goodwill as total assets increases on average (0.01% to 8.95%) from the period 1993-1997 to 1998-2003. This change is easily explicable by the introduction of the FRS 10[20] accounting standard, in 1998, which definitely prohibits the “goodwill writing-off to reserves” optional rule. As reported by Lin [2006], this option was widely used by British companies before 1998.

Finally, R&D as a percentage of total assets is much higher in the German (8.02% on average) and U.K. (7.89%) samples than in the French (5.76%) and Spanish (0.59%) samples. Two reasons could explain such a difference: either Spanish companies would invest much less in R&D than its European counterparts and / or they would tend to capitalize them more systematically (mainly because of fiscal purposes). This

latter explanation seems to be acceptable regarding the flexible capitalization rule of the "Real Decreto 743/1990" of the 20th of December 1990.

Insert TABLE 2 ABOUT HERE

Table 3 exhibits Pearson correlation matrix for each sample. The financial and accounting variables included in the matrix are the price index (PRIX), the firm operating income (OI), the firm's total sales, the amount of intangible assets (INTANG), the amount of goodwill (GW) and R&D expenditures (RND). The results of Table 3 seem to indicate that the level of intangible assets is positively correlated with the level of R&D expenditures in the French, Spanish and German countries. This last result would support the hypothesis formulated previously saying that the more a German (French or Spanish) firm exhibit R&D expenditures, the more it tends to capitalize them.

Insert TABLE 3 ABOUT HERE

5.2. Econometrical modelling results

Financial performance model. Panels A, B and C of Table 4 exhibits the White-corrected OLS estimates from model (2). Firstly, it is important to note that OLS estimates are mostly statistically significant (except γ_2 in eq.(10), eq.(11) and eq.(12)). Adjusted R^2 are similar to the ones presented by the accounting literature dealing with earnings coefficient response, spreading from 8.79 up to 18.32 across the country samples. Besides, coefficients γ_2 all take negative and statistically significant values (except in eq.(10), eq.(11) and eq.(12)), suggesting that investors while constructing their portfolios penalize firms investing intensively in intangibles. This short-term perspective or myopic view has been widely documented by authors (*see* for instance Porter [1992] and Hall [1993]). These authors assert that investors

look for short-term benefits and consequently delete away from their portfolios firms exhibiting high intangible investments. This hypothesis could explain the negative and significant value of the intangible investment response coefficients (i.e. γ_2) exhibited in Table 4.

TABLE 4 ABOUT HERE

Operational performance model. Panels A, B and C of Table 5 exhibit the estimates and statistics of OLS regression of model (4) combined with an Almon's [1965] second degree polynomial transform. Depending on the country sample observed, adjusted R^2s spread from 7.21 to 47.20. Moreover, Table 4 shows that 3 lags of intangible assets investments have a positive and statistically significant impact. Results are globally similar amongst the different country samples. However, it is important to underline that lags have a negative impact ($\Sigma\beta_k < 0$) in the German, and British samples (*see* Table 6) which suggests that reported intangible investments can be positively linked to negative operational profit in these samples. Finally, the reported R&D expenses seem to be negative correlated with operational profit in all the samples except in Spain. This result would suggest that French, German and U.K. accounting of R&D expenses are consistent as they do not allow for the capitalization of R&D which are not directly related to firm's profit performance.

The last line of each sub-table exhibits the sum of all OLS estimates for intangible investments, summing up the total impact of a one-monetary unit invested in such assets on the firm operation profit over a five-year period.

INSERT TABLE 5 ABOUT HERE

For clarity purpose, this last line is individually reported in Table 6. Results are once again presented by country and by intangible investments proxy.

INSERT TABLE 6 ABOUT HERE

Competitive performance model. Panels A, B and C of Table 7 exhibit the estimates and statistics of OLS regression of model (5) combined with an Almon's [1965] second degree polynomial transform. Depending on the country sample observed, adjusted R^2s spread from 8.69 to 54.31. Coefficients α_1 and α_2, estimates respectively of the natural of logarithm of the total number of employees and competitors are, for each model, statistically significant ($p<.01$). On the one hand, the number of employees seems to be positively correlated to a firm's market share. This would bring support to the hypothesis formulated by Ulrich & Smallwood [2004] which we discussed previously. However, as stated before, it should be noted that the variable 'ln(EMPLO)' could be also used as a proxy for firm size [*see* Williamson, 1967]. On the other hand, the total number of competitors is logically negatively correlated with a firm's market share.

Concerning the intangible investments variables, lags happen to be much less explicative than they were in previous models. As a whole, only 7 lags are statistically significant (for the intangible assets investment, lags 2 and 3 in France, lag 2 in Spain and lag 2 in the U.K.; for the goodwill stock investment, lag 3 in France; and for the R&D expenses, lag 2 in Spain and Germany). However, it is important to note that β_k estimates are globally positive although not significant in the French (12 estimates over 15), British (15 over 15) and German (9 over 15). These estimates appear to be negative in the Spanish sample (15 over 15). One possible explanation to this finding would be that market competition is much more intense on the French, UK and German markets and consequently intangible investments tend to be more efficient in these settings [*see* Nickell, 1996].

Moreover, Table 7 shows that 3 lags of intangible assets investments have a positive and statistically significant impact. Results are globally similar amongst the different country samples.

INSERT TABLE 7 ABOUT HERE

6. Robustness checks

There are three main concerns about the findings presented previously. The two first ones are classical econometrical issues, namely the periodical effects and the industry effects. The last one is about the common denominator bias that has been documented by Lev & Sunder [1979].

6.1. Control for periodical effects

As exhibited in Table 2, the MWW tests are significant for most of the financial and accounting variables suggesting the presence of difference between the two five-year periods (i.e. 1993-1997 and 1998-2003). In order to test the impact of this periodical and year effect, we introduced into the models 2, 4 and 5 binary variables. We also tested another version of this model by multiplying each exogenous variable by the dummy variables. The results of this test indicate that these control variables are significant while the coefficients' signs for all the three models (see Table 4, 5 and 6) do not change.

6.2. Control for industry effects

Similarly to the control for periodical effects, we introduce into both models a binary variable for each one-digit SIC industry. Binary variables for the following industries in France [(2) Food, textile & chemicals, (3) Manufacturing and (5) Wholesale & retail trade], Spain [(2) Food, textile & chemicals, (3) Manufacturing, (4) Transportation] do

impact significantly and positively the models' outcomes (except for the Spanish sample the competitive advantage model is impacted negatively). Concerning the German and U.K. companies, the SIC industries [(3) Manufacturing and (7) Lodging & entertainment] influence negatively the firm share return, positively the firm operating income and positively the market share.

6.3. Common denominator bias

Models 2 and 4 both use variables scaled by a common denominator (P_{jt-1} in (2), $SALES_{jt-1}$ in (4)). As noted by Lev & Sunder [1979], these models might be biased by false correlations due to the presence of a common denominator accross the exogenous and endogenous variables as the denominator is not a exogenous variable on its own.

Consequently, in order to test the robustness of the models 2 and 4, we introduce the variable $1/P_{t-1}$ in model (2) and the variable $1/ SALES_{jt-1}$ in model (4). The test outcomes does not appear to be significant in terms of the estimates' signs for all the samples. However, it is interesting to note that the presence of a common denominator in the models slightly increase the adjusted R^2 on average (+2.2% for the French sample, +4.1% for the Spanish sample, +3.7% for the U.K. sample and +2.5% for the German sample).

7. Conclusion

Motivated by the recent works by Lev [2001b ; 2004] and Villalonga [2004], and the current debate surrounding the international financial reporting standard n°38 (i.e. IAS 38) adoption related to reported intangible investment issues, this study investigates whether European firms using national generally accounting principles (hereafter, GAAP) exhibit differences while considering the relationship between firm performance and reported intangible investment.

Authors widely assert that intangible assets are the major drivers of firm value and performance in most economic sectors, but the benefits, whether financial, operational or competitive, from reporting these assets has eluded so far managers, accountants, and financial analysts.

Using a four-representative-European-country (i.e. France, Germany, Spain and U.K.) dynamic data panel, we investigate whether intangible accounting numbers in these different settings can be significantly linked, during the period 1993-2003, to the following performance triptych: financial, operational and competitive performance. Reported intangible investment is measured herein by three accounting proxies: the change in goodwill stock, the change in reported intangible assets stock and the research and development (R&D) expenditures. Besides, both measures of stock are based on the Griliches' [1981] stock equation.

Assuming UK GAAPs intangible requirements are the closest to the IFRS setting, we examine independently each national accounting design and gauge their differences in terms of firm performance regarding the UK framework as a sensible benchmark.
Based on the accounting valuation setting widely documented by Sougiannis (1994) and Lev & Sougiannis (1996), our findings bring us towards the following three concerns:

(1) Firstly, in any stock market under scope, we do find clear evidence that while constructing their investment portfolios investors adopt a short-term perspective or "myopic view" by precluding firms from reporting high intangible investment in their financial statements.

(2) Secondly, regardless the national GAAP under consideration, we do not find any evidence that reported intangible investments underpin a better competitive position

inside a specific market. We conclude that relationship between reported intangibles and the firms' competitive advantage should not be held constant in future research designs.

(3) Finally, our results clearly support the idea that Latin accounting frameworks, while opposed to UK settings and subsequently to International disposals, ease the relationship recognition occurring between intangibles and the firm operational performance. This last result would suggest that IAS implementation could lead to disconnect progressively operational margins from reported intangibles as their valuations are, under IFRS, overall market-oriented. As a consequence, this latter finding would not support widespread claims that IAS produce financial statements of higher informational quality about the firms' operational activities.

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[1] In a study of the US stock markets, Nakamura [2001] reports that firms' annual raw intangible investments have progressively increased from 4.4% of the GDP in 1978 up to 10.5% in 2000, leading to a yearly increasing rate close to 4%.

[2] In its Statement of Financial Accounting Concepts n°1, the U.S. F.A.S.B. [1978: 34] states, "[…] financial reporting should provide information that is useful to present and potential investors and creditors and other users in making rational investment, credit, and similar decisions".

[3] A public or private information is said to be « value-relevant » if it does significantly impact a firm stock price [Beaver, 1981].

[4] *See* Cañibano *et al.* [2000] for a comprehensive literature review on that topic.

[5] The R&D accounting treatment is an epitome of the problems coming out from the transferability of the US studies' results to an international context. Indeed, most of the previous studies base their investigation scope on US listed firms' samples. These firms must, for instance, comply with the requirements of the Statement N°2 of the FASB, published in November 1974. This standard enforces US companies to pass through the Profit & Loss account R&D expenditures during the period of their occurrence (some exceptions can be encountered such as the accounting treatment of software development costs by the SFAF N°86 standard). This accounting requirement diverges substantially from European national standards that can be observed in Germany, France, Spain and the United Kingdom where capitalization is often authorized (*see* for instance, in Spain, "el Decreto Real 743/1990" of the 20th of December 1990, in the UK, the R&D capitalization prerequisites of SSAP 13, in France, the CRC 2004-06 standard dispositions and in Germany the criteria of the article 258 of the *Handelgesetzbuch / Commercial code*).

[6] Unlike many previous studies, Villalonga [2004] uses a relatively exhaustive panel of variables in order to capture the firm intangible resources. Thus, she uses the following variables as a proxy for such resources: the amount of firm intangible assets as scale by firm total assets, the goodwill stock, the

R&D expenses stock, the advertising expenses and the amount of other intangibles assets as scaled by firm total sales.

[7] Because scale effects may influence our econometric results, these variables are standardized by "total price / return index" in the financial performance model and by "total sales" in the operational performance model.

[8] In our study, a rate of 10% is assumed. All the results reported in table 3 to 7 are thus computed with a depreciation rate of 10% (i.e. equivalent to a 10-year period of utility).

[9] A possible version of this model consists in including intangible investments lags to examine the intangible effects over time :

$$R_{jt} = \gamma_0 + \gamma_1 * (BPA_{jt} + I_{jt}) / P_{jt-1} + \sum_{k=1}^{5} \phi_k * (I_{j(t-k)} / P_{j(t-k-1)}) + \varepsilon_{jt} \quad (3)$$

However, including in this study such a model would be redundant and inconsistent with model (4) and the Fama's efficiency theorem as the endogenous variable of model (3) are the model (2)'s exogenous variables [for further details see Lev & Zarowin, 1998].

[10] Financial variables have also been collected at the end of the financial period 1992 in order to increase of one unit the model (2)'s degree of freedom.

[11] For empirical considerations and implications of this model, *see* Lev & Gu [2001].

[12] According to Lev's [2001b] perspective, economic benefits are assimilated to a firm's operating income standardized by its total sales.

[13] The abnormal benefits concept is here understood as the additional benefit part realized by a firm relatively to its more direct competitors (see Villalonga [2004]).

[14] Lev & Zarowin [1998] prescribe to apply to each of these coefficients a discount rate before summing them up. In this study, we choose to follow Sougiannis' [1994] simpler method which consists in ignoring the discount rate and any empirical costly hypotheses that come with it.

[15] Concerning the Almon [1965] polynomial transform implementation, the SAS software only proposes a ready-to-use Almon [1965] procedure for time-series data. Consequently, we programmed an Almon routine in I.M.L. SAS language adapted to dynamic panel data in order to obtain the results exhibited in tables 5 to 7.

[16] Market share is here defined as the ratio of the firm's total sales over the total sales of all the sampled companies evolving in the firm's specific two-digit SIC industry.

[17] Here, the labour force is proxied by the natural logarithm of the end-of-period firm's total number of employees. It is worth noting that this variable is also proxy the firm size. The subsequent variable's results should be then interpreted carefully.

[18] For a succinct listing of the "data-construction" procedures applicable to R&D variables, *see* Villalonga [2004 : 227].

[19] For further details on this procedure, refer to Hall [1990 : 39-43].

[20] F.R.S. (Financial Reporting Standard) N°10, Goodwill and Intangible Assets.

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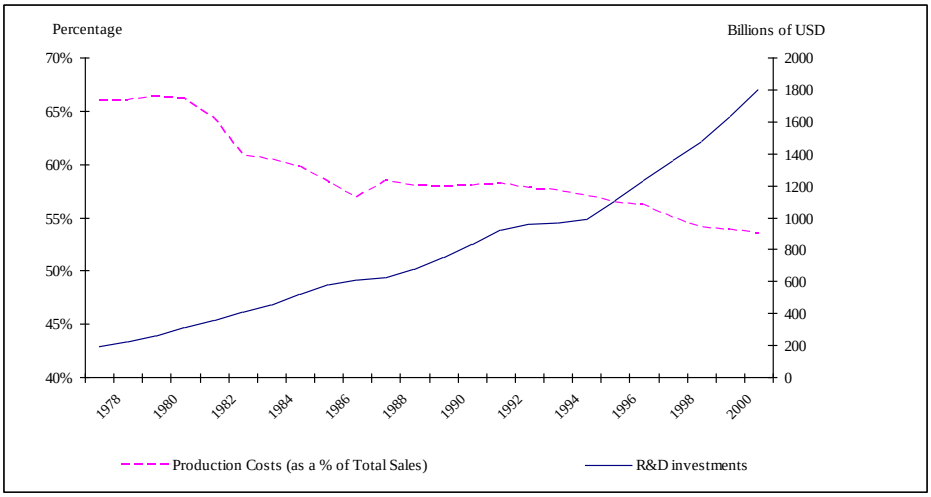
Exhibit 1. Comparison between the evolution of the production costs to total sales ratio and the R&D investments to total sales for US firms during the period 1977-2000.



Source: Nakamura [2001], Federal Reserve Bank of Philadelphia Database

TABLE 1

Breakdown of the country samples by year and by one-digit SIC industry

SIC	Industry Description	France		Spain		U.K.		Germany		Total	
0	Agricultural	7	1%	0	0%	17	2%	1	0%	25	1%
1	Mining & construction	24	4%	11	10%	100	9%	10	2%	145	6%
2	Food, textiles & chemicals	95	17%	34	30%	191	18%	79	16%	399	18%
3	Manufacturing	139	25%	23	20%	239	22%	177	36%	578	26%
4	Transportation	40	7%	22	19%	116	11%	31	6%	209	9%
5	Wholesale & retail trade	69	13%	10	9%	157	15%	38	8%	274	12%
7	Lodging & entertainment	140	25%	11	10%	198	18%	122	25%	471	21%
8	Services	37	7%	4	3%	62	6%	27	6%	130	6%
	All sectors	***551***	*100%*	***115***	*100%*	***1,080***	*100%*	***485***	*100%*	***2,231***	*100%*

Table 1 presents a breakdown of the data panel by sampled country and by one-digit SIC code. Companies included in the final data set are the ones whose financial and accounting variables are available respectively under Compustat and DataStream. As previously stated, financial and utility companies, i.e. firms with SIC Codes comprised between 6000 and 6999 (financial institutions), and between 9100 and 9199 (government and utility companies), are excluded from the analyzed sample. The third, fourth, fifth and sixth column of table 1 present this breakdown for respectively France, Spain, U.K. and Germany. The last column present the total numbers of company observations analyzed in the study.

TABLE 2

Descriptive statistics per country and per five-year period

			Period 1993-1997				Period 1998-2003				Total Sample					
Variable	**Definition**	**Country**	**N**	**Mean**	**Median**	**σ**	**N**	**Mean**	**Median**	**σ**	**N**	**Mean**	**Median**	**σ**	**K**	**Sk**
RET	**Share return (%)**	Spain	239	19.70	16.94	35.76	492	1.23***	4.44***	31.41	731	7.10	7.49	32.44	-0.24	-0.01
		France	753	7.89	5.38	29.80	2,241	-7.82***	-1.84***	45.36	2,994	-3.53	0.45	41.34	0.75	-0.66
		U.K.	2,584	5.75	6.67	29.08	4,978	-5.01***	0.00***	47.40	7,562	-1.13	2.18	41.28	0.99	-0.56
		Germany	541	4.09	3.29	27.24	2,167	-21.72***	-9.80***	64.53	2,708	-16.19	-5.16	58.71	0.76	-0.80
OI / SALES	**Operating income**	Spain	320	13.02	9.37	12.30	631	11.44**	9.21	9.20	951	11.93	9.30	10.05	1.37	0.94
	to total sales ratio (%)	France	1,064	7.19	6.70	5.86	2,826	5.42***	6.00**	9.98	3,890	6.03	6.17	8.49	5.10	-1.32
		U.K.	3,132	9.09	8.59	10.13	5,848	1.64***	6.32***	27.97	8,980	4.61	7.24	21.15	23.51	-4.24
		Germany	1,014	5.49	4.77	5.68	3,037	-4.82***	3.55***	29.24	4,051	-1.31	3.91	21.63	15.91	-3.64
INTANG / TA	**Percentage of intangibles**	Spain	332	3.06	1.54	3.88	649	7.15***	4.00***	8.19	981	5.66	2.85	6.94	2.15	1.60
	in total assets (%)	France	1,094	9.25	6.18	9.64	2,837	13.16***	8.61***	12.91	3,903	12.12	7.99	12.11	0.28	1.10
		U.K.	3,199	0.63	0.00	2.64	5,891	11.18***	3.79***	15.33	9,089	7.26	0.13	12.77	3.58	2.05
		Germany	1,042	3.58	1.12	5.36	3,098	9.93***	5.15***	11.71	4,140	8.24	3.33	10,57	2.28	1.68
GW / TA	**Percentage of goodwill**	Spain	333	0.78	0.08	1.44	629	3.98***	1.22***	5.29	962	2.82	0.56	4.47	2.27	1.81
	in total assets (%)	France	1,095	4.69	1.76	6.56	2,830	8.51***	4.20***	10.43	3,925	7.41	3.30	9.56	1.49	1.51
		U.K.	3,253	0.00	0.00	0.01	5,967	8.95***	1.92***	13.36	9,220	5.35	0.00	10.60	4.82	2.32
		Germany	1,047	2.15	0.00	4.29	2,999	6.52***	2.05***	9.05	4,046	5.34	0.95	8.17	2.60	1.80
RND / SALES	**RND expenses**	Spain	246	0.33	0.15	0.45	532	0.72**	0.22*	1.07	778	0.59	0.19	0.89	6.06	2.37
	to total sales ratio (%)	France	253	3.98	3.23	3.56	664	6.68**	3.46	8.91	917	5.76	3.42	7.05	5.59	2.20
		U.K.	1,026	3.17	1.17	6.72	2,076	11.39***	2.02***	32.09	3,102	7.89	1.68	21.72	38.75	5.80
		Germany	214	4.88	3.77	4.02	877	9.15***	4.84***	12.43	1,091	8.02	4.54	10.19	12.39	3.08

For the Mann-Whitney-Wilcoxon (MWW) test's results, the following conventions are used : *p<.1 (two-sided t-test); **p<.05 (two-sided t-test); ***p<.01 (two-sided t-test).

TABLE 3
Pearson correlation matrix

Panel A: French sample

	PRICE	*OI*	*SALES*	*INTANG*	*GW*
PRICE	1.000				
OI	0.194***	1.000			
SALES	0.157***	0.794***	1.000		
INTANG	0.090***	0.756***	0.724***	1.000	
GW	0.125***	0.567***	0.548***	0.759***	1.000
RND	0.079*	0.773***	0.803***	0.639***	0.342***

Panel B: Spanish sample

	PRICE	*OI*	*SALES*	*INTANG*	*GW*
PRICE	1.000				
OI	0.188***	1.000			
SALES	0.278***	0.745***	1.000		
INTANG	0.270***	0.597***	0.734***	1.000	
GW	0.182***	0.430***	0.509***	0.757***	1.000
RND	0.288***	0.603***	0.624***	0.875***	0.673***

Panel C: U.K. sample

	PRICE	*OI*	*SALES*	*INTANG*	*GW*
PRICE	1.000				
OI	0.344***	1.000			
SALES	0.255***	0.756***	1.000		
INTANG	0.158***	0.347***	0.411***	1.000	
GW	0.106***	0.264***	0.290***	0.820***	1.000
RND	0.194***	0.414***	0.445***	0.306***	0.207***

Panel D: German sample

	PRICE	*OI*	*SALES*	*INTANG*	*GW*
PRICE	1.000				
OI	0.790***	1.000			
SALES	0.678***	0.729***	1.000		
INTANG	0.452***	0.563***	0.499***	1.000	
GW	0.284***	0.383***	0.396***	0.861***	1.000
RND	0.588***	0.719***	0.610***	0.530***	0.327***

Panels A, B, C and D of Table 3 (standing respectively for France, Spain, U.K. and Germany) present Pearson correlation matrices for the key variables of our analysis. PRICE is here defined are the total price index. The following conventions are used: *p<.1; **p<.05; ***p<.01.

TABLE 4

Estimators and statistics of the regression of share return on intangible investments

Table 4 exhibits the model (2) statistics for each of the country samples:

$$R_{jt} = \gamma_0 + \gamma_1 * (BPA_{jt} + I_{jt}) / P_{jt-1} + \gamma_2 * (I_{jt} / P_{jt-1}) + \varepsilon_{jt}$$

Where P_{jt} is the firm j 's share price (i.e. total price index) at the end of the period t ;
R_{jt} is the firm j 's share return (i.e. total return index) at the end of the period t ;
BPA_{jt} stands for the earning (i.e. operating income) per share of the firm j at the end of the period t ;
I_{jt} is the intangible investment per share of the firm j at the end of the period t.

- $\Delta INTANG_{it}$ is the change in intangible assets stock over the period t (*see* the perpetual inventory equation (1)),
- ΔGW_{it}, is the change in goodwill stock as computed by (1), and
- RND_{it} is the R&D expenditures realized over the period t.

N.B.: All the exogenous variables are on a *per share* basis.

Panel A. Model (2) with exogenous variable = $\Delta INTANG_{it}$

Estimates (t-statistics)	U.K.	GERMANY	FRANCE	ITALY	SPAIN
Intercept	0.195*** (15.49)	0.109*** (7.32)	0,153*** (9,02)	0.139*** (5.26)	0.212*** (6.55)
$\gamma 1$	0.232*** (8.62)	0.155*** (6.65)	0,071*** (4,15)	0.352*** (4.71)	0.154 (0.78)
$\gamma 2$	-0.353*** (-5.16)	-0.102** (-2.14)	-0,099** (-2,34)	-0.451*** (-2.79)	-0.198 (-0.45)
Adjusted R^2	2.72	4.38	1.17	4.47	0.95
F-test	47.19***	24.84***	8.78***	11.20***	2.48*
N	3,300	1,040	1,314	436	309

Panel B. Model (2) with exogenous variable = ΔGW_{jt}

Estimates (t-statistics)	U.K.	GERMANY	FRANCE	ITALY	SPAIN
Intercept	0.194*** (15.47)	0.109*** (7.34)	0.152*** (9.01)	0.134*** (5.20)	0.213*** (6.51)
$\gamma 1$	0.231*** (8.57)	0.157*** (6.77)	0.071*** (4.05)	0.348*** (4.65)	0.093 (0.45)
$\gamma 2$	-0.351*** (-5.07)	-0.106** (-2.25)	-0.097*** (-1.99)	-0.335** (-2.27)	-0.058 (-0.12)
Adjusted R^2	2.71	4.36	1.15	4.36	0.94
F-test	47.03***	24.69***	8.66***	10.94***	2.47*
N	3,300	1,040	1,314	436	309

Panel C. Model (2) with exogenous variable = RND_{jt}

Estimates (t-statistics)	U.K.	GERMANY	FRANCE	ITALY	SPAIN
Intercept	0.203*** (15.70)	0.113*** (7.30)	0.166*** (9.53)	0.134*** (5.08)	0.227*** (6.83)
$\gamma 1$	0.158*** (7.49)	0.155*** (6.52)	0.059*** (3.58)	0.349*** (4.61)	0.120** (2.24)
$\gamma 2$	-0.811** (-4.62)	-0.280* (-1.87)	-0.713*** (-3.43)	-0.337 (-0.96)	-5.05* (-1.77)
Adjusted R^2	2.91	4.27	1.85	4.36	1.89
F-test	50.43***	24.17***	13.37***	10.93***	3.98**
N	3,300	1,040	1,314	436	309

Table 4 exhibits the coefficients and t-statistics of the White-corrected coefficient (in parentheses) obtanied from the linear regression of model (2) for each of the three following intangible investment proxies: $\Delta INTANG_{jt}$, ΔGW_{jt} and RND_{jt}. The following conventions are used : *p<.1 (two-sided t-test); **p<.05 (two-sided t-test); ***p<.01 (two-sided t-test).

TABLE 5

Estimators and statistics of the regression of operating income on intangible investments

Table 4 exhibits the model (4) statistics for each of the four country samples:

$$OI_{jt} / SALES_{jt} = \alpha_0 + \alpha_1 * (TA_j / SALES_j)_{t-1} + \sum_{k=1}^{5} \beta_k * (I_j / SALES_j)_{t-k} + \varepsilon_{jt}$$

where

OI_{jt} stands for the operating income of the firm j at the end of the period t ;
$SALES_{jt}$ is the firm j's total sales as reported at the end of the period t ;
TA_{jt} is the firm j's total assets as reported at the end of the period t ;
I_{jt} is the intangible investment per share of the firm j as reported at the end of the period t.

- $\Delta INTANG_{it}$ is the change in intangible assets stock over the period t (*see* the perpetual inventory equation (1)),
- ΔGW_{it}, is the change in goodwill stock as computed by (1), and
- RND_{it} is the R&D expenditures realized over the period t.

Panel A. Model (4) with exogenous variable = $\Delta INTANG_{it}$

Endogenous variable = OI_{jt} / $SALES_{jt}$

Estimates (t-statistics)	*Equation (13)* **FRANCE**	*Equation (14)* **U.K.**	*Equation (15)* **SPAIN**	*Equation (16)* **GERMANY**
α_0	0.058***	0.114***	0.034***	0.054***
	(4.36)	(18.55)	(5.21)	(10.17)
α_1	-0.005***	-0.016***	0.053***	-0.025***
	(-12.07)	(-7.30)	(18.04)	(-5.05)
β_1	0.158**	-0.040*	-0.077***	-0.184***
	(2.14)	(-1.94)	(-2.68)	(-9.69)
β_2	0.133***	-0.031***	-0.076***	-0.092***
	(3.44)	(-2.92)	(-3.47)	(-9.68)
β_3	0.116**	-0.072***	-0.068***	-0.031***
	(2.29)	(-7.31)	(-3.20)	(-9.42)
β_4	0.109	-0.163	-0.054	-0.001
	(0.09)	(-0.16)	(-0.05)	(-0.00)
β_5	0.110	-0.303***	-0.032	0.001
	(1.59)	(-13.06)	(-0.83)	(0.27)
R^2	17.64	16.50	39.93	12.80
Adjusted R^2	17.17	16.37	39.48	12.39
Wald test	<.0001	<.0001	<.0001	<.0001
N	707	2,645	545	843
$\Sigma\beta_\kappa$	0.626	-0.609	-0.307	-0.307

TABLE 5 (to be continued)

Panel B. Model (4) with exogenous variable = ΔGW_{it}

Endogenous variable = OI_{jt} / $SALES_{jt}$

Estimates (t-statistics)	*Equation (17)* **FRANCE**	*Equation (18)* **U.K.**	*Equation (19)* **SPAIN**	*Equation (20)* **GERMANY**
α_0	0.059***	0.104***	0.028***	0.066***
	(4.30)	(16.87)	(4.08)	(14.57)
α_1	-0.011***	-0.019***	0.051***	-0.038***
	(-21.03)	(-9.20)	(17.20)	(-10.68)
β_1	0.176*	-0.008	-0.049	0.117***
	(1.71)	(-0.33)	(-0.94)	(2.60)
β_2	0.144**	-0.070***	0.064	0.060***
	(2.32)	(-5.77)	(1.44)	(2.67)
β_3	0.113*	-0.082***	0.147***	0.021***
	(1.66)	(-7.58)	(2.60)	(2.80)
β_4	0.084	-0.042	0.201	0.001
	(0.07)	(-0.04)	(0.17)	(0.00)
β_5	0.057	0.048	0.225*	-0.001
	(0.58)	(1.39)	(1.88)	(-0.95)
R^2	23.49	7.34	47.76	12.71
Adjusted R^2	23.28	7.21	47.20	12.29
Wald test	<.0001	<.0001	<.0001	<.0001
N	1,453	2,857	382	825
$\Sigma\beta_\kappa$	0.574	-0.154	0.588	0.198

Panel C. Model (4) with exogenous variable = RND_{jt}

Estimates (t-statistics)	U.K.	GERMANY	FRANCE	ITALY	SPAIN
α_0	-0.165**		0.026***		
	(-2.05)		(2.61)		
α_1	-0.012***		0.014***		
	(-3.47)		(3.66)		
β_1	0.511		0.511		
	(1.91)		(1.91)		
β_2	-0.055		-0.055		
	(-0.21)		(-0.21)		
β_3	-0.267		-0.267		
	(-1.00)		(-1.00)		
β_4	-0.125		-0.125		
	(-0.03)		(-0.03)		
β_5	0.371		0.371		
	(0.73)		(0.73)		
Adjusted R^2	7.30		0.89		
F-test	65.34***		3.95***		
N	3,268		1,314		
$\Sigma\beta_\kappa$					

Table 4 exhibits the coefficients and t-statistics of the White-corrected coefficient (in parentheses) obtanied from the linear regression of model (4) for each of the three following intangible investment proxies : $\Delta INTANG_{jt}$, ΔGW_{jt} and RND_{jt}.. In order to avoid any multicollinearity issues between the 5 variable lags due to the over time stability of the accounting variables, an Almon [1965] second-degree polynomial transform is performed. The following conventions are used : *p<.1 (two-sided t-test); **p<.05 (two-sided t-test); ***p<.01 (two-sided t-test).

TABLE 6
Intangible investment impact on operating profit over a five-year period

	$\Sigma\beta_k$			
	FRANCE	U.K.	SPAIN	GERMANY
Model lag variable				
$\Delta INTANG_{jt}$	0.626	-0.609	-0.307	-0.307
ΔGW_{jt}	0.574	-0.154	0.588	0.198
RND_{jt}	-0.288	-0.689	2.043	-1.002
Mean	0.304	-0.484	0.775	-0.370
Median	0.574	-0.609	0.588	-0.307

TABLE 7
Estimators and statistics of the regression of market share on intangible investments

Table 7 exhibits the model (5) statistics for each of the four country samples:

$$SALES_{jt} / (\sum_{k=1}^{N} SALES_{kt}) = \alpha_0 + \alpha_{1*} \ln(EMPLO_{jt}) + \alpha_{2*} \ln(COMP_{jt}) + \sum_{k=1}^{5} \beta_{k*} (I_j / SALES_j)_{t-k} + \varepsilon_{jt}$$

where

$SALES_{jt}$ is the firm j's total sales as reported at the end of the period t ;

$SALES_{jt} / \Sigma\ SALES_{kt}$ stands for the firm j's total sales over the financial period t scaled by the total sales of firm j's sector

ln(EMPLOjt) is the natural logarithm of the end-of-period firm j 's number of employees ;

ln(COMPjt) is the natural logarithm of the end-of-period firm j 's number of competitors within a two-digit SIC industry ;

I_{jt} is the intangible investment per share of the firm j as reported at the end of the period t.

- $\Delta INTANG_{it}$ is the change in intangible assets stock over the period t (*see* the perpetual inventory equation (1)),
- ΔGW_{it}, is the change in goodwill stock as computed by (1), and
- RND_{it} is the R&D expenditures realized over the period t.

Panel A. Model (5) with exogenous variable = $\Delta INTANG_{it}$

Endogenous variable = $SALES_{jt} / \Sigma\ SALES_t$

Estimates (statistiques t)	*Equation (25)* **FRANCE**	*Equation (26)* **U.K.**	*Equation (27)* **SPAIN**	*Equation (28)* **GERMANY**
α_0	-0.095**	0.391*	-0.013***	0.067***
	(-4.20)	(1.79)	(-5.07)	(2.58)
α_1	0.037***	0.213***	0.040***	0.022***
	(15.88)	(8.54)	(4.89)	(7.53)
α_1	-0.042***	-0.524***	-0.328***	-0.053***
	(-8.48)	(-6.74)	(-8.57)	(-14.12)
β_1	0.006	0.009	-0.096	0.008
	(0.23)	(0.55)	(-1.58)	(0.46)
β_2	0.027*	0.012	-0.053*	0.004
	(1.74)	(0.77)	(-1.87)	(0.46)
β_3	0.036*	0.012*	-0.024	0.001
	(1.69)	(1.97)	(-1.49)	(0.43)
β_4	0.024	0.014	-0.007	-0.001
	(0.02)	(0.51)	(-0.01)	(-0.00)
β_5	-0.001	0.001	-0.003	-0.001
	(-0.01)	(0.07)	(-0.27)	(-0.24)
R^2	38.10	9.13	26.05	27.83
Adjusted R^2	37.55	8.95	25.46	27.40
Wald test	<.0001	<.0001	<.0001	<.0001
N	570	3,599	410	825

TABLE 7 (to be continued)

Panel B. Model (5) with exogenous variable = ΔGW_{it}

Endogenous variable = $SALES_{jt}$ / Σ $SALES_t$

Estimateurs (t-statistics)	*Equation (29)* **FRANCE**	*Equation (30)* **U.K.**	*Equation (31)* **SPAIN**	*Equation (32)* **GERMANY**
α_0	-0.078***	0.397*	-0.019***	0.065*
	(-5.66)	(1.95)	(-0.28)	(1.88)
α_1	0.034***	0.202***	0.040***	0.023***
	(24.89)	(5.80)	(4.74)	(5.72)
α_2	-0.040***	-0.500***	-0.330***	-0.052***
	(-13.63)	(-7.89)	(-9.65)	(-10.36)
β_1	-0.010	0.007	-0.051	-0.048
	(-0.43)	(0.42)	(-0.53)	(-0.88)
β_2	0.019	0.009	-0.066	-0.023
	(1.23)	(0.65)	(-1.04)	(-0.83)
β_3	0.032**	0.008	-0.070	-0.007
	(2.09)	(0.61)	(-0.99)	(-0.63)
β_4	0.030	0.010	-0.06	0.001
	(0.03)	(0.63)	(-0.05)	(0.00)
β_5	0.012	0.001	-0.040	-0.001
	(0.59)	(0.10)	(-0.27)	(-0.19)
R^2	41.36	8.86	25.87	25.30
Adjusted R^2	41.11	8.69	25.25	24.57
Wald test	<.0001	<.0001	<.0001	<.0001
N	1,178	3,889	411	512

Panel C. Model (5) with exogenous variable = RND_{jt}

Endogenous variable = $SALES_{jt}$ / Σ $SALES_t$

Estimates (t-statistics)	*Equation (33)* **FRANCE**	*Equation (34)* **U.K.**	*Equation (35)* **SPAIN**	*Equation (36)* **GERMANY**
α_0	-0.164***	1.335**	-0.374	-0.065
	(-8.28)	(2.39)	(-0.54)	(-0.12)
α_1	0.039***	0.280***	0.044***	0.037***
	(24.31)	(6.14)	(5.11)	(7.00)
α_2	-0.020***	-0.875***	-0.329***	-0.059***
	(-4.79)	(-9.17)	(-7.16)	(-7.58)
β_1	0.005	0.091	-0.520	0.056
	(0.38)	(0.31)	(-1.07)	(0.91)
β_2	0.007	0.051	-0.436**	0.034*
	(0.32)	(0.29)	(-1.97)	(1.69)
β_3	0.007	0.033	-0.349	0.020
	(0.22)	(0.19)	(-1.41)	(0.68)
β_4	0.004	0.368	-0.259	0.014
	(0.00)	(0.22)	(-0.08)	(0.01)
β_5	-0.001	0.006	-0.166	0.016
	(-0.02)	(0.41)	(-0.77)	(0.91)
R^2	54.71	13.41	25.27	32.00
Adjusted R^2	54.31	12.83	23.26	30.99
Wald test	<.0001	<.0001	<.0001	<.0001
N	569	1,061	410	340

Table 7 exhibits the coefficients and t-statistics of the White-corrected coefficient (in parentheses) obtanied from the linear regression of model (5) for each of the three following intangible investment proxies : $\Delta INTANG_{jt}$, ΔGW_{jt} and RND_{jt}.. In order to avoid any multicollinearity issues between the 5 variable lags due to the over time stability of the accounting variables, an Almon [1965] second-degree polynomial transform is performed. The following conventions are used : *p<.1 (two-sided t-test); **p<.05 (two-sided t-test); ***p<.01 (two-sided t-test).