Measuring the Intellectual Capital of Italian listed companies

WILLIAM FORTE[*], JON TUCKER[†], GAETANO MATONTI[‡], GIUSEPPE NICOLÒ[§]

ABSTRACT

Purpose – This paper investigates the relationship between Intellectual Capital (IC), measured in terms of the Market to Book (MTB) ratio, and potential key determinants of IC value such as intangible assets (IA) and a range of other factors.

Design/methodology/approach – The study is conducted for a sample of 140 Italian corporations over the period 2009-2013. Applying a holistic market-based approach, the relationship between IC value and selected determinants from the extant literature is tested. Five hypotheses are tested using a pooled OLS regression model, while controlling for time. ROE is employed as a useful firm profitability indicator from the perspective of an equity investor. Moreover, four robustness tests are undertaken.

Findings – The results show that IA, profitability, leverage, industry type, auditor type, and family ownership positively affect IC value, whereas SIZE and AGE negatively affect IC value. Moreover, the findings of the robustness tests suggest that all firms, and not just KIBS industry firms, manage knowledge.

Research limitations/implications - The validity of the findings is limited to the Italian context, as the study focuses on a sample of companies listed on the Milan Stock Exchange, all of which prepare their individual financial statements according to IFRS. Further limitations are related to the use of market value in the short term, as it is influenced by market volatility. The study may allow academic researchers to investigate the impact of other non-accounting sources of information on market value within a multidisciplinary perspective.

Practical implications - This paper also has implications for managers and practitioners. The findings suggest that managers should not take for granted that firm growth (an increase in SIZE) alone will lead to an increase in IC value, in the absence of a consistent IC-oriented investment strategy. Managers should also avoid smoothing their IC investment as the company grows, in order to maintain a stable MTB ratio. Further, standard setters should seek to explore better means of disclosing non-accounting information relating to IC value.

Originality/value – This paper contributes to the IC literature as it is the first study which applies the Market Capitalization approach to analyze IC value determinants in the Italian context, within the framework of IFRS. The findings reveal some interesting relationships between the MTB ratio and recognized intangible investments, which are found to be insignificant in previous studies, confirming that, through the holistic effect, the MTB ratio may be a good proxy for IC.

Keywords: Intellectual Capital, Intangible Assets, Market to Book Ratio, Italy, Listed Companies.

Paper type – Research Paper.

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1. Introduction

Over the decades, the world economy has moved from an industrial to a knowledge economy (Guthrie and Petty, 2000; Marr *et al.*, 2004; Lev *et al.*, 2005; Dženopoljac *et al.*, 2016), within which firms pursuing value creation and competitive advantage have focused their attention on developing their intangible and knowledge assets as critical factors to success (Li *et al.*, 2008; Sonnier *et al.*, 2009; Yi and Davey, 2010). Intellectual capital (IC) is commonly referred to as intangible assets (IA), and takes the form of knowledge, brands, patents and trademarks, customer relationships, human capital, and research and development (Lev *et al.*, 2005; Sonnier *et al.*, 2009; Dženopoljac *et al.*, 2016). In this new economy, IC is considered as the preeminent resource for generating economic wealth and growth (Guthrie and Petty, 2000; Bontis, 2003; Siboni *et al.*, 2013) as well as a strong driver of firm performance and market value (Bozzolan *et al.*, 2003; Sonnier *et al.*, 2009). Moreover, investment in IC is increasingly important to firms seeking to achieve productivity and efficiency gains, and it thereby constitutes a crucial constituent of innovation in relation to business processes and products (Lal Bhasin, 2012). The recent literature explores various definitions of IC and develops several frameworks and measurement instruments for IC components, spurred on by a growing awareness of the benefits that IC reporting and measurement may have for a company in terms of: support for the determination of strategies; improvement in the evaluation of implemented strategies; support in the assessment of mergers and acquisitions; and improvement in the communication with external stakeholders (Bontis, 2003; Marr *et al.*, 2003; Lal Bhasin, 2012).

Stewart (1997) argues that IC gauges the intellectual resources, knowledge, experience, information, competitiveness and learning of organizations used for the purposes of wealth production. The World Intellectual Capital/Assets Initiative (2016, p.12) considers IC as "the internal (competencies, skills, leadership, procedures, know-how, etc.) and external (image, brands, alliances, customer satisfaction, etc.) stock of dynamically interrelated intangibles available to an organization, which allows the latter to transform a set of tangible, financial and human resources into a system capable of pursuing sustainable value creation". The guidelines of the EU's MERITUM project (2002) divide IC into three categories: human capital, structural capital, and relational capital. Human capital is defined as the knowledge and skills that employees bring with them when they leave the company. Structural capital is seen as the knowledge which remains within the company when employees leave, and includes organizational routines, procedures, cultures, databases, and so on. Finally, relational capital comprises all external relationships such as formal business collaborations and all other informal links to external entities such as customers, suppliers, banks, and non-profit organizations (Leitner, 2004).

Despite a wealth of studies that highlight the importance of IC to firm value creation and the need to develop appropriate measurement tools, traditional financial accounting still does not take into account the full range of intangible resources that drive a company's value and its growth prospects (Edvinsson and Malone, 1997; Bontis, 2003; Oliveras *et al.*, 2008; Lal Bhasin, 2012; Abhayawansa and Guthrie, 2016; WICI, 2016). From an accounting perspective, most IA are not identifiable, excepting assets covered by specific legal rights (e.g. patents and trademarks) that may be recognized only when they are purchased (IAS 38). Moreover, researchers do not yet have a universally accepted instrument to enable the measurement of intellectual capital value (Goebel, 2015; Dženopoljac *et al.*, 2016).

According to the existing literature, IC may be considered as a significant 'hidden value' that is not captured in the financial statements, the value of which may be gauged in the difference between firm market value and book value (Edvinsson and Malone, 1997; Brennan, 2001; Ordóñez de Pablos, 2003; Oliveras *et al.*, 2008; Ruta, 2009). Thus, one suitable method for determining the value of the intellectual (intangible) assets of a company is to compare its market to its book value

by computing the market to book (MTB) ratio (Kok, 2007). In recent years, several studies employ the Market Capitalization Approach (MCA), based on the MTB ratio, in order to estimate IC value (Brennan, 2001; Bramhandkar *et al.*, 2007; Kok 2007; Whiting and Miller, 2008; Goebel 2015; Kuo-An Tseng *et al.*, 2015). This approach assumes that financial markets do not gauge IC value by analyzing the statement of financial position and the income statement (Sveiby, 1997a; Penman, 2009; Goebel, 2015). Instead, Lal Bhasin (2012) argues that financial markets are more accurate in their valuation of companies, and any excess valuation of a company over its book value will be the correct valuation of the company's IA. Bramhandkar *et al.* (2007, p. 359) argue that the MTB ratio measure is "well-established in the literature and, although broad, readily identifies those organizations doing a better job with their knowledge assets".

The authors apply the MCA to study a sample of 140 Italian companies listed on the Milan Stock Exchange over the period 2009 to 2013, and in so doing aim to test the relationship between the MTB and selected determinants that, according to the literature, may exert some impact upon IC value. Given the paucity of studies on the measurement of IC value and its determinants, particularly in the Italian context in which the few existing studies tend to employ the "aggregate components approach" and content analysis, our paper contributes to the IC measurement literature by examining the relationship between IC value (MTB) and its potential determinants such as IA, and other variables, using an econometric modelling approach. The results of this paper show that IA, auditor quality, profitability, and family ownership are positively associated with IC value, while firm size and age are negatively associated with IC value.

The rest of the paper is organised as follows. Section 2 discusses the existing literature on IC measurement, focusing on recent developments in measuring intellectual capital. In section 3 the authors develop hypotheses for the potential determinants of the MTB ratio. In section 4 the research methodology and sample selection are explained. Finally, the results of the models are discussed in section 5, with robustness tests in section 6. Section 7 then provides a summary and conclusion.

2. Intellectual capital measurement in the existing literature

The accounting and business management research literature reports a variety of approaches to the measurement of IC (Morariu, 2014; Goebel, 2015; Dženopoljac *et al.*, 2016). The first group is based on a Scorecard Approach which aims to describe, but not always measure the value of, IC with respect to a range of both non-financial indicators and selected financial ratios in order to gauge specific IA, and reports by means of integrated scorecards or graphs. However, the approach, exemplified by models such as the Skandia Navigator (Edvinsson and Malone, 1997) and the Intangible Assets Monitor (Sveiby, 1997b), does not measure the financial value of IC, at least at the firm level.

The second group is based on an IC Expense-Investment Approach (Goebel, 2015) that classes certain IC-related expenses, as reported in the income statement, as IC investments that generate an excess return on assets, or alternatively, "knowledge capital earnings" (Lev and Zarowin, 1999). Pulic (1998) develops a Value Added Intellectual Coefficient (VAIC) which is based on the traditional concept of the value added resulting from the sum of net income plus personnel expenses. However, the VAIC approach has been criticized by Goebel (2015) for two reasons. Firstly, the VAIC approach considers human capital (proxied by labour expenses recognized in the income statement) as an investment rather than a cost. Secondly, the VAIC approach relates all operating expenses to IC capital.

The third group constitutes an Aggregate Components approach which aims to estimate the value of specific individual IA, and then derives the total aggregate value of IC. However, this approach is difficult to implement in practice as quantitative information on individual IC

components is frequently incomplete or unreliable. Moreover, it ignores the holistic effect of the synergistic interaction of IC elements on overall IC value (Mouritsen, 2009). Models such as the IA Valuation approach of Sullivan (2000) attempt to investigate the contribution of individual IA to a company's market value. The Market Valuation Model of Pantzalis and Park (2009) relates human capital, measured as the ratio of total firm employees to total industry employees, to market value. However, among other limitations, their model does not consider two critical components of human capital, that is, investment in the training and education of employees. In an Italian study of Human Capital valuation models, Zanda *et al*. (1993) measure the capitalization of costs relating to training and education, as well as extraordinary losses incurred if trained employees leave a firm. Further models based on direct estimates of individual IA include the following approaches: Technology Broker (Brooking, 1996); Citation-Weighted Patents (Bontis, 1998); Inclusive Valuation Methodology (McPherson, 1998); The Value Explorer (Andriessen and Tiessen, 2000); Total Value Creation (Andersen and McLean, 2000); and Accounting For The Future (Nash, 1998).

The final group focuses on a MCA which takes into account the holistic effects of interactions between IC components which typically generate an overall value greater than the aggregate value of the individual estimates (Van der Meer-Kooistra and Zijlstra, 2001). This approach measures the value of a company's intellectual capital as the difference between the company's market capitalization and its book value. Thus, a positive IC value is generated by a firm where its MTB ratio exceeds unity (Stewart, 1997; Luthy, 1998). The excess of market capitalization over book value, generated by information sets far wider than the accounting system, measures that 'covered' portion of IC not currently represented in reported assets or expenses, at the least to the extent that can be incorporated in market expectations.

Consistent with recent studies such as Brennan (2001), Bramhandkar *et al*. (2007), Whiting and Miller (2008), and Lal Bhasin (2012), in this paper the authors adopt the MCA, focusing on the MTB ratio in order to fill an important gap in the existing accounting literature regarding the measurement and determinants of IC in an Italian listed firm context. In so doing, the authors seek to determine the extent to which potential determinants of IC value selected from the extant literature, such as IA, influence the MTB ratio.

3. Hypothesis development

A set of coherent hypotheses related to the potential determinants of IC value is tested according to the existing theoretical and empirical IC literature. Moreover, consistent with Dumay (2014), additional hypotheses are constructed on the basis of management, corporate governance and organizational studies which extend beyond the field of IC, thereby adopting a transdisciplinary approach.

3.1. Intangible assets

Edvinsson (1997) and Lev and Zambon (2003) argue that IA are an important component of IC and thus there is some overlap between the two. Intangible assets, like IC, have been a key focus of business management studies in recent years (Bontis, 2003). It is argued that improved and better-utilized knowledge has a beneficial influence on company performance (Roos and Roos, 1997). According to the resource based view (RBV) of the firm, Villalonga (2004) points to intangible resources as the main drivers of the sustainability of performance differences across firms. The RBV prediction concerning the role of intangibles in sustaining superior firm performance may be formalized by arguing that the more intangible resources a firm has, the greater the sustainability of its competitive advantage.

Employing a market-based approach focused on the holistic effects of IC value, Goebel (2015) investigates the relationship between IC, proxied as the long-run value to book value (LRVTB), and IA, though finds no significant relation. Villalonga (2004) measures IC using R&D expenditure, advertising expenditure (recognized in the income statement for the year) and (capitalized) intangible assets recognized on the balance sheet, and finds that R&D and advertising expenditures are important components of IC value since there is a positive association between these variables and Tobin's q across different industry sectors. Here, Tobin's q replaces book value with its replacement cost in the MTB ratio.

Thus, consistent with the existing literature (Villalonga, 2004; Goebel, 2015) the following hypothesis is proposed:

H1: IC value is positively associated with recognized (visible) intangible assets.

3.2. Firm size

As Youndt *et al.* (2004) and Goebel (2015) argue, firm size may be a positive driver of IC value, given the advantages of better access to resources enjoyed by larger firms along with their greater market power. On the other hand, in their study of dividend paying firms, Fama and French (2001) highlight that smaller firms have better growth opportunities, higher asset growth rates, and thus a higher MTB ratio. Moreover, Loderer *et al.* (2016), in their study of firm rigidities and growth opportunities, find that size has no impact on Tobin's q.

It is important to investigate the influence of this variable on IC value (Pucci *et al.*, 2015), consistent with the MCA. Size is measured in a variety of ways in the existing literature. Size proxies include: market capitalization (White *et al.*, 2007; Castelo Branco *et al.*, 2011); total assets (Cerbioni and Parbonetti, 2007; Nurunnabi *et al.*, 2011; Goebel, 2015); and firm sales (Atan and Rahim, 2012). Moreover, some studies use more than one of these proxies (Bozzolan *et al.*, 2003; Youndt *et al.*, 2004; Oliveira *et al.*, 2006; Reed *et al.*, 2006) to capture firm size.

Fama and French (2001) find that smaller firms have a higher MTB ratio, while Loderer *et al.* (2016) find that firm size has no impact on the negative relationship between firm age and Tobin's q. In the IC literature, Goebel (2015), analyzing a sample of German listed companies, uses the natural logarithm of total assets as a proxy for firm size, and argues for a positive relationship between the dependent variable, LRVTB (a variant of the MTB ratio), and firm size. However, she finds a negative but significant relationship between the two variables. In contrast, Reed *et al.* (2006) find a significant positive relationship between a proxy of IC value and firm size in the banking sector.

In accordance with the existing literature (Cerbioni and Parbonetti, 2007; Nurunnabi *et al.*, 2011; Goebel, 2015), firm size is measured as the natural logarithm of total assets (SIZE). Thus, consistent with previous studies (Youndt *et al.*, 2004; Reed *et al.*, 2006; Goebel, 2015) the following hypothesis is proposed:

H2: IC value is positively associated with company size.

3.3. Firm age

The inclusion of a variable for firm age (*AGE*), or length of establishment, recognizes the fact that companies develop IC value over time in a cumulative manner (Nahapiet and Ghoshal, 1998), though evidence on the relationship between firm age and IC value in the existing literature is somewhat mixed. Aside from the IC literature, many authors have studied the relationship between firm age and market value. In particular, Leonard-Barton's (1992) study points out that the core competencies could inhibit firm growth because of the tendency of firms to change them into core rigidities over the time. Loderer *et al.* (2016), following company life-cycle theories, highlight a negative relationship between firm age and the Tobin's q ratio, underlining how

younger firms tend to invest more in growth opportunities, thereby obtaining a higher market value, while older firms invest less in R&D, tending to concentrate their efforts on the better management of assets in place, thus causing a decline in Tobin's q over time. Moreover, Pastor and Veronesi (2003) find that younger firms have a higher MTB ratio than older firms due to initial uncertainty concerning their future profitability which instead tends to fall over time due to the learning effect, causing a decrease in the MTB ratio. Moreover, within the sphere of IC studies, Goebel (2015) finds a negative but insignificant relationship between IC value and firm age, while Youndt *et al.* (2004) also find no influence of firm age on IC value. In contrast, Reed *et al*. (2006) find that firm age has a significant positive influence on IC value in their study of retail banks, though find no such relation for commercial banks. On balance, and drawing largely upon theory arguments rather than existing evidence, a negative relation is expected between IC value and firm age.

H3: IC value is negatively associated with firm age.

3.4. Firm profitability

Reed *et al*. (2006) and Youndt *et al*. (2004) find evidence that higher IC leads to higher competitive advantage and thus company performance. According to Keenan and Aggestam (2001), focusing on IC is important as it transforms more tangible physical and financial capital into added value and improved performance. Nicholson and Kiel (2004) show that firms must pay specific attention to IC when seeking to improve their performance. Therefore, consistent with the existing literature, the authors measure profitability in terms of return on equity as it should be a better indicator of firm profitability from the perspective of an equity investor than alternative measures such as the return on assets. The authors propose the following hypothesis:

H4: IC value is positively associated with firm profitability.

3.5. Leverage

Lenders to the firm will often be influential stakeholders. Indeed, as the debt to total assets ratio increases, lenders may gain greater influence on the firm's management, driving them to accelerate their investment in IC as well as encouraging them to better manage IC resources given their relevance for value creation (Keenan and Aggestam, 2001; Goebel, 2015). This effect is likely to be more pronounced for countries with insider governance systems, prevalent in countries such as Germany and Japan, as discussed by Dignam and Galanis (2009) and Goebel (2015). While lenders do not exert such a strong influence in Italian companies, their influence is nonetheless potentially important. In Italy, SMEs are more affected by the influence of lenders, and in particular banks.

Elshandidy and Neri (2015) argue that the monitoring role of the corporate governance structure (i.e. the presence of independent managers) improves the stewardship function of the firm, introduces an external control mechanism that reduces agency costs, mitigates information asymmetries, and encourages managers to provide more accurate company risk information. Elshandidy *et al.* (2013) find that firm leverage positively influences the level of risk information that firms provide in their narratives. Through a company's risk profile, investors are able to better estimate company market value, and to make more accurate investment decisions (Elshandidy and Neri, 2015). Therefore, a positive relation is expected between leverage (*DE*) and IC value.

H5: IC value is positively associated with leverage.

3.6. Control variables

The authors introduce a range of control variables in order to investigate their effect on IC value and to guard against omitted variable bias. Recognizing that company IC investments and

performance outcomes may vary systematically across industries, the authors assign firms to either KIBS (knowledge-intensive business service) industry or TI (traditional industry) groups according to their respective NACE codes. KIBS companies are deemed to bear the distinctive traits of the so-called knowledge-based economy. The notion of KIBS was introduced by Miles *et al.* (1995) to denote companies whose job consists of collecting, generating, analyzing, and distributing knowledge with the aim of providing solutions to the problems that their client firms are not able, or willing, to deal with by themselves. Thus, IC and IA may be more important in KIBS industries characterized by the competitive advantage generated by protected knowledge and significant capital investment in R&D. However, Morariu (2014), who studies Romanian listed companies, finds an insignificant association between the VAIC and industry type (KIBS vs. TI). Goebel (2015) groups sample firms in three industry sectors: consumer, pharmaceutical and technology, and industrial, and finds no relation between company industry membership and IC value, but finds a weak relationship between knowledge-based industry sector membership and IC value. Thus, consistent with the existing literature (Goebel, 2015), and taking into account the innovation catalyst feature of KIBS industries in generating intellectual capital, a positive relation between the MTB ratio and the control variable IND is expected.

Auditors play an important role in the presentation of annual report information. According to Wallace *et al.* (1994), auditor size can influence the content of the annual reports prepared by firms given that large, prominent auditing firms may encourage companies to disclose more information. Oliveira *et al.* (2006) argue that the aim of auditors is to preserve their reputation, develop their expertise, and ensure that they retain their clients. Elshandidy and Neri (2015) argue that an external auditor can influence the level of firm voluntary disclosure, thereby enhancing investor confidence as well as reducing earnings management activities, leading to a better market assessment. So, it may reasonably be expected that companies engaging a Big-4 auditor will disclose more intellectual capital information compared to companies with less prominent auditors with the aim of improving their market value. Most investments in IC are immediately expensed in the period in which they are incurred. Consequently, while investors are regularly informed about changes in physical and financial assets via mandatory annual and interim reports, there is relatively little public information on the nature of IC investments. This creates a problem for investors when valuing a company's shares as they have little or no information about the productivity, or change in value, of IC investments. Thus, engaging a high quality auditor may enhance IC disclosure in order to reduce information asymmetry (Li *et al.*, 2012). Consistent with existing studies, a positive relationship between *AUDIT* and MTB is expected.

In their conceptual study, Keenan and Aggestam (2001) highlight that there are important connections between IC and corporate governance, focusing on the patterns of stakeholder influence that affect managerial decision-making. In particular, scholars point out that diverse and relatively unconcentrated ownership may have less influence on governance, leading to less concern about the IC of the firm. In the case of ownership concentrated in the hands of relatively few stakeholders, governance of the firm's IC may prove problematic. Ownership and governance with little expertise concerning IC may fail to execute fiduciary responsibility for directing and influencing the leverage of such IC. Moreover, a high level of managerial ownership may induce the entrenchment effect instead of the alignment effect for managerial ownership (Saleh *et al.*, 2009). Risk aversion and managerial myopia may also influence managerial decisions on IC investment which may in turn affect IC value. Managerial myopia leading to a focus on short term performance may cause managers to prefer investments in tangible assets rather than in IC as the former are easier to monitor and control as well easier to justify than the latter. Investment in tangible assets is associated with lower uncertainty and risk, thereby strengthening the position of managers. Goebel (2015), who studies German listed companies, examines ownership structure as

a potential determinant of IC value, though finds no evidence of it influencing IC value. Consistent with this study, the expected direction of the relation between governance (ownership concentration and family ownership) and IC value is not specified in this paper. Two corporate governance measures are adopted in this paper. First, the degree of ownership concentration by controlling stakeholders is measured. The dummy variable *OWN* takes a value of 1 if shareholders control at least 50% of the voting rights, and 0 otherwise. Second, the dummy variable *FAM* takes a value of 1 if at least 50% of the voting rights or outstanding shares are held by a family block holder, and 0 otherwise.

4. Research methodology and sample selection

The study sample includes all Italian companies listed on the Electronic Market of the Milan Stock Exchange. Our study period commences in 2009 in order to avoid the direct effect of the global financial crisis on firm market values, and extends to the year 2013. Accounting, financial market and corporate governance data are collected from the AIDA and ORCID Databases. The sample of firms initially included 232 companies, representing all those Italian firms listed in 2009. From this sample, firms that were delisted due to mergers, acquisitions, or bankruptcy, and firms with missing data were removed, arriving at a final balanced panel of 140 Italian listed firms, giving a total of 700 firm-year observations, as shown in Table I.

[Insert Table I here]

To assign the dummy value to the variable *IND*, the sample firms are categorized according to their respective NACE industry codes, as shown in Table II.

[Insert Table II here]

Following Schnabl and Zenker (2013), sample firms are categorized into KIBS industry firms starting from their NACE code, as shown in Table III. According to this categorization criteria, Table III also shows that 25 companies are categorized as KIBS (17.86%) and 115 (82.14%) as TI, from a total of 140 listed companies. Thus, the control variable IND takes the value 1 if the company is a KIBS, the value 0 otherwise.

[Insert Table III here]

A standard OLS regression model, as given in Equation 1, is employed, where the dependent variable (*MTB*) is a continuous variable measured as the mean of the beginning and the end value of market to book ratio for each year in order to smooth some of the volatility in market value over the post-crisis period.

$$MTB = \alpha_{i,t} + \beta_1 TINT_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 AGE_{i,t} + \beta_4 ROE_{i,t} + \beta_5 DE_{i,t} + \beta_6 IND_{i,t} +$$
$$\beta_7 AUDIT_{i,t} + \beta_8 OWN_{i,t} + \beta_9 FAM_{i,t} + \varepsilon_{i,t} \qquad (1)$$

Where: MTB = the mean MTB ratio over the financial year, winsorised at the 1% level in order to remove outliers; $TINT$ = total intangibles assets; $SIZE$ = natural logarithm of total assets; $AUDIT$ = auditor type dummy variable; ROE = return on equity ratio; OWN = ownership concentration dummy variable; FAM = family ownership concentration dummy variable; AGE = natural logarithm of firm age in years; DE = debt-equity ratio; IND = industry dummy; and ε = model error term.

In a departure from the recent literature (Maditinos, 2011; Morariu, 2014; Goebel, 2015), this paper is focused on the MTB ratio for several reasons. It is expected that firm market and book values will never be equal. In particular, the book values of publicly traded firms mainly reflect the value of the tangible and capital assets of the company (Crăciun and Scriosteanu, 2008). Indeed, according to *IAS 38 (Intangible Assets)*, unlike tangible assets most IA are difficult to identify and are recognized on the statement of financial position only when they are purchased separately or as part of business combination, but are not recognized when they are developed within the firm. Moreover, the future economic benefits arising from IA are uncertain (Schiemann *et al.*, 2015), thereby violating one of the requirements for asset recognition in the financial statements.

Thus, accounting standards give rise to inadequate IC accounting and to an "asymmetric recognition of intellectual capital in the financial statements" (Schiemann *et al.*, 2015, p.8). Hence, a way to measure the value of IC is to assume that efficient financial markets inherently perform accurate valuations, and that any excess of market over book value will constitute a correct valuation of the firm's IA (Lal Bhasin, 2012). Thus, when there is a large difference between a firm's market and book values, that difference may be attributed to IC (Edvinsson and Malone, 1997; Brennan, 2001; Ordóñez de Pablos, 2003; Kok, 2007; Whiting and Miller, 2008; Lal Bhasin, 2012; Kuo-An Tseng *et al.*, 2015).

However, some shortcomings of the MTB ratio as an estimator of IC value may also be identified. Dumay (2012) and Goebel (2015) criticize the MTB ratio as an indicator of IC value due to: (i) the application of historic cost accounting (which influences book value); and (ii) market value fluctuations being potentially driven by environment or economic factors other than IC value. The study sample in this paper consists of listed firms which prepare their financial statements following IAS/IFRS, so the problem of historic cost accounting is at least partially avoided as most of the assets and liabilities are assessed at their "fair" values. Furthermore, the MTB ratio is measured in this paper as the mean MTB between the beginning and the end of year value, in order to reduce the effect of market value fluctuations. Finally, ease of calculation and the availability of data are also important considerations which render this measure one of the most widely used tools to evaluate IC among the alternatives (Ghosh and Wu, 2007; Godyn, 2013). The values of the MTB ratio are provided by the AIDA Database.

Table IV provides detailed definitions of the set of independent variables, along with a summary of coefficient signs expected from theory and the hypotheses to be tested.

[Insert Table IV here]

5. Results and discussion

5.1 Descriptive statistics

Tables V and VI report the descriptive statistics for the continuous and dummy model variables, respectively, for the sample period 2009-2013. Each table shows the statistics for full sample, KIBS industry, and TI firms in panels A, B, and C, respectively.

[Insert Tables V and VI here]

Table V shows that the *MTB* ratio for the full sample of firms has a mean of 1.365, and so market value exceeds book value for the average firm as expected, that is, firms on average create significant market value over their book value base. For the KIBS and TI industry firm subsamples, an *MTB* ratio of 1.749 and 1.281 is respectively observed. Thus, the *MTB* ratio is on average higher for KIBS industry firms than for TI industry firms. These findings suggest that in general substantial

differences exist between company market and book values (Brennan and Connell, 2000). Lipunga (2014) highlights that such differences may be explained by IC assets not recognized in company balance sheets (Brennan and Connell, 2000). Gan and Saleh (2008) argue that while some of these differences are attributable to the current value of physical and financial assets exceeding their historical cost, a large proportion is due to the rise in the importance of IA. According to Abeysekera (2007) IC held by a firm can be thought of as a form of 'unaccounted capital' in accordance with the traditional accounting system terminology, and may be described as the knowledge-based equity that supports the knowledge-based assets of a firm.

Panel A shows that sample firms have an intangible asset to total assets (*TINT*) ratio of 0.068, while KIBS industries and TI (Panels B and C, respectively) show *TINT* ratios of 0.046 and 0.073, respectively. These findings provide evidence that while both KIBS industry firms and TI firms invest in IA (6.8%), the former have recognized IA ratios (4.6%) which are lower than those of the TI companies (7.3%). This finding may be explained by the greater tendency of KIBS companies to invest in as yet unrecognized IA than is the case for TI companies. This finding also suggests that financial investors price IC in a holistic manner through other non-financial information. This may explain why KIBS industry companies have a higher MTB ratio compared to TI companies. Sample firm size is, on average, 12.843, while KIBS industry firms and TI firms have similar mean sizes of 12.834 and 12.846, respectively. The overall sample mean *AGE* of companies is 3.366 (28.96 years), while the age of KIBS industry firms and TI firms is 3.047 (21.05 years) and 3.436 (31.062 years), respectively. Overall, Panel A shows that sample firms have a mean ROE of 25.7%, while KIBS industry firms (Panel B) and traditional industry firms (Panel C) have a mean ROE of –95.5% and 52.0%, respectively, showing that, on average, KIBS industry firms are less profitable than traditional industry firms. It is noted here that many of the sample firms reported negative earnings for some of the sample years, leading to negative profitability ratios. Further, the scale of the ratios is greater than might be anticipated due to relatively low sample period equity values. For the overall sample across the five years of the analysis, firms have a mean debt/equity ratio of 97%, while KIBS industry firms and TI firms (Panels B and C) have mean ratios of 69.4% and 103%, respectively. Table VI shows that, on average, sample firms have fairly high ownership concentration, with 57.1% having a concentration of over 50%, while KIBS industry firms and TI firms have concentrations of 40.0% and 60.9%, respectively. These findings show that TI firms are more likely to exhibit high ownership concentration than KIBS industry firms. The overall sample shows that on average 22.9% of firms enjoy greater than 50% family ownership, while 16.0% and 24.3%, of KIBS industry firms and TI firms, respectively, enjoy such ownership. Thus, TI firms have a higher degree of family ownership than KIBS industry firms. Finally, 88.4% of sample firms engage a Big 4 auditor for their financial auditing, with 86.4% and 88.9% of KIBS industry firms and TI firms, respectively, using such an auditor.

5.2 Correlation analysis

Table VII presents a Pearson correlation matrix. There is a strong positive correlation between the dependent variable (*MTB*) and *ROE* (0.165, p=0.000) and *DE* (0.213, p=0.000), a moderate correlation between *MTB* and *IND* (0.110, p=0.002), and a weaker positive correlation with *TINT* (0.084, p=0.026) and *FAM* (0.089, p=0.018). A strong negative correlation exists between *MTB* and *AGE* (-0.171, p=0.000), and a weaker negative correlation exists with *SIZE* (-0.093, p= 0.014). The strong negative correlation between *MTB* and *AGE* may be explained in that as firms age, they incur structural and process-related rigidities that are difficult to discard (Loderer and Waelchli, 2010; Leonard-Barton, 1992). The Pearson (Spearman) correlation shows a positive correlation between *AUDIT* and *SIZE* of 0.282 (0.286), significant at the 1% level. There is a positive correlation between *ROE* and *SIZE* of 0.160 (0.225, p=0.000), significant at the 1% level. This suggests that

larger firms are in general more profitable than smaller firms. There is a positive correlation between *AGE* and *SIZE* of 0.105 (0.090), significant at the 1% (5%) level. Thus, on average, larger firms have a longer length of establishment than younger firms. The Pearson (Spearman) correlation between *IND* and *TINT* of -0.085 (-0.153) is significant at the 5% (1%) level, suggesting that KIBS industry firms are less heavily invested in IA than are TI firms. Finally, to test for potential multicollinearity issues, a Variance Inflation Factors, though not reported, was computed for all of the variables, however finding that the statistics are well below the threshold of 2 in each case.

[Insert Table VII here]

5.3 Regression analysis

Table VIII presents the results of a pooled linear regression model to examine the relationship between the MTB ratio and those explanatory variables that should exert an impact upon it. The model has an R-squared statistic of 15.54% and an Adjusted R-squared statistic of 13.94%, respectively (Prob>chi-square = 0.000; F(13, 686) = 9.71). The model controls for years.

[Insert Table VIII here]

The coefficient of *TINT* is, as expected, positive and significant at the 1% level. This finding is consistent with Villalonga (2004), and inconsistent with Goebel (2015) who finds no such association between this variable and IC. So, consistent with Stewart (1997), Brennan (2001) and Ordóñez de Pablos (2003), this positive relationship underlines that the MTB ratio represents an approximate measure of IC. More specifically, value may be generated by intangibles that are not always reflected in the financial statements, and forward-looking companies realize that such assets are an integral component of the performance of their business. Thus, increasing investment in (recognized) IA tends to increase the market to book ratio in firms, probably because the financial market, through these investments, "reads" the signal of a higher future firm value. Accordingly, hypothesis H1 is accepted.

The coefficient of *SIZE* is negative and significant at the 1% level. Thus, it would appear that the MTB ratio falls as firm size increases, evidencing that bigger firms due to their lower flexibility and greater complexity face more difficulties in the development of IC (Goebel, 2015). From an empirical point of view, this result is consistent with Goebel (2015), and not consistent with Fama and French (2001). Accordingly, hypothesis H2 is rejected.

The coefficient of *AGE* is negative and significant, as expected, at the 1% level. So, as Loderer *et al*. (2016) argued, younger firms invest more in R&D and in radical innovation while older firms concentrate their efforts more on incremental innovation and in the better management of assets in place. In this way, MTB tends to decrease over time as a result of the recognition in the balance sheet of those assets which are initially only ideas in production. Hence, this result sheds light on the prevalence of IC investment in younger and more innovative firms compared to that in older companies. A different explanation of the negative relation between *MTB* and *AGE* may be explained in that increasing firm age may make knowledge, abilities, and skills obsolete and induce organizational decay, due to structural and process-related rigidities (Loderer and Waelchli, 2010; Leonard-Barton, 1992). This finding is inconsistent with Youndt *et al*. (2004) and Goebel (2015), neither of whom find a significant association between firm age and the MTB ratio, and consistent with Pastor and Veronesi (2003) and Loderer *et al*. (2016). Accordingly, hypothesis H3 is accepted.

The coefficient of *ROE* is positive, consistent with expectations, and is significant at the 1% level. Thus, it would appear that increasing firm profitability leads to an increase in firm MTB ratios. This

result is consistent with Reed *et al.* (2006), Youndt *et al.* (2004). Accordingly, hypothesis H4 is accepted.

The sign of *DE* is positive, consistent with expectations, and is significant at the 1% level, consistent with Goebel (2015) and Keenan and Aggestam (2001). Thus, lenders may encourage more active monitoring of IC investment and management of IC value in firms. Accordingly, hypothesis H5 is accepted.

With regard to the control variables, and according to expectations, *IND* is positively associated with the dependent variable *MTB*, and is significant at the 1% level. The finding is in part consistent with Goebel (2015) who, grouping sample firms in three industry sectors (consumer, pharmaceutical and technology, and industrial) finds a significant and positive relationship only for pharmaceutical and technology firms. One interpretation here is that knowledge development effort is significantly bound to industry sector membership. KIBS industry firm value is probably held to a greater extent in as yet unrecognized accounting assets such as protected knowledge, which has the effect of decreasing book value and increasing MTB ratios. Moreover, this result confirms that IC value exists in the majority of Italian companies, both in KIBS industry firms and TI firms. Panels B and C show that KIBS industry firms have a higher MTB ratio (mean = 1.749) than TI firms (mean = 1.281).

The coefficient of the *AUDIT* variable is positive and significant at the 5% level, consistent with expectations and the prior literature (Wallace *et al.*, 1994; Oliveira *et al.*, 2006). As existing accounting standards allow IC investments to be expensed immediately, financial reports fail to adequately reflect such value-creating assets (Lev and Zarowin, 1999). As a consequence, this gives rise to increasing information asymmetry between firms and the users of their financial reports (Barth *et al.*, 2001). Thus, engaging a high quality (Big-4) auditor may give rise to better firm disclosure of IC information (Li *et al.*, 2012) which in turn influences firm value, reduces investor uncertainty about future prospects, and facilitates a more precise valuation of the company.

The sign of *OWN* is negative, which is inconsistent with expectations, though the coefficient is insignificant. The finding is consistent with Goebel (2015), and inconsistent with Saleh *et al.* (2009), who find a significant negative relationship between ownership concentration and IC value. It would appear that the high degree of ownership concentration observed across most of the sample firms (see Table VI), leads to less modelled variation with the dependent.

The effect of *FAM* is positive, consistent with expectations, and significant at the 5% level, providing support for the influence of this "control" variable. This finding is inconsistent with Saleh *et al.* (2009) who analyze listed Malaysian companies and find a negative and significant relationship between family ownership and VAIC. The finding provides evidence for an alignment effect in these concentrated firms (Saleh *et al.*, 2009), showing an influence of managerial decisions on the IC investment in these firms. The weak relation may result from only 22.9% of sample firms having family ownership exceeding 50%. Thus, family controlled companies appear to perform better than non-family controlled companies by creating more value.

6. Robustness tests

To ensure the robustness of the findings in the main model, the investigation was repeated using a different dependent variable and a different ratio to measure firm profitability. The findings obtained, as shown in Table IX, are qualitatively similar to those shown for Model 1 in Table VIII. Only the differences in relation to the main model (Model 1) are highlighted here. Model 2 is similar to Model 1, though the *ROA* ratio (as provided by the AIDA Database) takes the place of *ROE* as the profitability independent variable. Model 2 has an adjusted R-square of 10.61% which is lower than the 13.94% observed for Model 1. The coefficient signs of the independent variables

are similar to those in Model 1, except for the profitability measure *ROA* itself, which is positive though insignificant, and *FAM* which is positive and significant at the 10% level. These findings would appear to suggest that *ROA* is not a good predictor of firm MTB value.

[Insert Table IX here]

In Models 3 and 4, the dependent variable is the MTB ratio lagged one-year lag (as provided by the AIDA Database), and computed as the mean of the beginning and the end value. Model 3, which includes *ROE* as an indicator of business efficiency, has an adjusted R-square of 7.92%. The coefficient signs of the independent variables and their significance are comparable to that of Model 1, except for *AUDIT* which is positive, though insignificant, and *FAM* which is positive and significant at the 1% level. These findings suggest that investments in IA, the ROE ratio, KIBS status, leverage, and family ownership impact upon the MTB lagged one-year. Model 4, which uses *ROA* as an indicator of business profitability, has an adjusted R-square of 9.96%. The coefficient signs of the independent variables and their significance are comparable to that of Model 1, except for *ROA* which is positive, though insignificant, *AUDIT* which is positive and significant at the 1% level, and *OWN* and *FAM*, both of which are positive though insignificant. These findings suggest that investments in IA, KIBS status, and the auditing system impact upon the MTB ratio lagged one-year.

Model 5 is very similar to Model 1, using the same dependent variable, but the control variable *IND* is removed in order to avoid its effect on the dependent variable. Model 5 has an adjusted R-square of 12.74%. The coefficient signs of the independent variables and their significance are comparable to those of Model 1, except for *FAM* which is positive and significant at the 1% level. Model 5 suggests that the MTB ratio is not strongly influenced by the industry sector to which a firm belongs. This finding is consistent with the study of Leonard-Barton (1992), suggesting that for any organization (whether KIBS or TI) to be competitive, it needs to build core competencies that are difficult and challenging to attain in order to respond to future industry changes. As a consequence, investor and financial markets may price these competencies through some non-accounting information concerning the dynamics of new product development.

7. Conclusion

This paper contributes to the IC literature as it is the first study which applies the Market Capitalization approach to analyze IC value, measured in terms of the MTB ratio, and its potential determinants within the Italian listed firm context, as governed by IFRS. The empirical results of this study show that the value of TINT disclosed in the financial statements, firm profitability, firm leverage, industry membership, Big four auditor engagement, and family ownership positively affect IC value, while firm size and age negatively affect IC value. The results are further confirmed by the robustness tests conducted whereby MTB lagged one-year is used as the dependent variable. The findings provide evidence that ROA is not a good predictor of the MTB ratio, probably as investors are more interested in overall firm performance (as captured by the ROE ratio). Moreover, the results show that ownership concentration is an insignificant driver of IC value.

The results evidence the holistic effects created by interactions between IC components which typically generate an overall value greater than the aggregate value of the individual estimates (Van der Meer-Kooistra and Zijlstra, 2001). Indeed, the IC measurement approach employed in this paper highlights how the excess of market capitalization over book value, generated by information sets far wider than the accounting system, measures the 'covered' portion of IC not currently represented in reported assets or expenses, at least to the extent that can be

incorporated in market expectations. So, the study provides a critical approach to the extant research on the effect of IAS/IFRS adoption on the disclosure of intellectual capital. There are limitations of the accounting perspective and of financial information when measuring IC value, especially with regard to the distorting effect of historical costs on the difference between market and book value, though Italian listed companies have prepared both consolidated and separate financial statements according to IAS/IFRS since 2005. As a consequence, assets and liabilities are assessed mostly at "fair" values, which are not closely related to the historical cost convention. Thus, the remaining positive difference between market and book value should reflect well the price of intangible resources that are as yet unrecognized in the financial statements but that the financial markets, by using other sources of information, manage to appraise in assessing a company's intellectual capital. In summary, the findings of this paper suggest that the MTB ratio is a good predictor of IC, despite the limitations of this ratio highlighted in the literature. Moreover, use of the MTB ratio is pervasive given its ease of calculation for investors.

This study is subject to a number of limitations. First, the sample is restricted to 140 Italian listed companies due to difficulties in obtaining a larger firm financial dataset. Second, the MTB ratio measure employed as the dependent variable may suffer limitations as a result of historical cost accounting and equity market value fluctuations. Third, as some of the model variables are time-invariant, a pooled OLS regression with control for years is employed. Ideally it would be useful to measure continuous governance variables instead of simple dummy measures.

This study has implications for academic researchers, practitioners and managers. The approach employed may allow academic researchers to investigate the impact on market value of other non-accounting sources of information. For practitioners, the positive relationship between the MTB ratio and total intangible assets value suggests that listed firms, when reviewing their strategies, should invest more in IA in order to grow their market value more rapidly. Traditionally, the only IA recognized in the financial statements were intellectual property, such as patents and trademarks, and acquired items such as goodwill. Although it is still not possible to assign monetary values to most internally generated IA, they nevertheless need to be considered if the process of value creation is to be properly understood, suggesting that additional information on non-recognized intangible (e.g. internally generated) assets helps investors to assess a company's potential for future earnings growth, thereby helping to reduce share price volatility through time. This in turn should reduce the risks associated with a company and should therefore result in a lower cost of capital. Furthermore, in the empirical results of this paper, size is measured as the total value of all assets; as a consequence, the findings imply, for managers and practitioners, that an increase in market value cannot be simply attributed to "growth" in itself, but should also be the result of a consistent IC-oriented investment policy. According to Bozzolan *et al.* (2003), While et al., (2007), Bruggen (2009), and Taliyang *et al.* (2011), firm size should influence the amount of IC disclosure, and not MTB value. Moreover, an explanation for the negative association between SIZE and the dependent variable may be that bigger companies lose efficiency at creating IC value when working within complex structures.

The negative association between age and the dependent variable suggests that companies tend to smooth their innovation efforts over the company's life, and this strategic choice may produce negative effects for company market value if not counterbalanced by adequate investment in IC resources. Moreover, the study may provide helpful ammunition for those public policy-makers engaged in financing and/or providing fiscal incentives to innovative companies, selecting them from among other "start-up" companies; while standard setters should seek to explore better means of disclosing non-accounting information relating to IC value. Further, consistent with the findings of Leonard-Barton (1992), Model 5 (the robustness test) suggests that the MTB ratio is not only related to KIBS industry membership, but it is also related to core competencies to be found

in TI. Consistent with Omotayo (2015), this finding suggests that it is essential for the management of any company, KIBS or otherwise, to look for a means to gain, maintain, and manage knowledge in order to achieve higher levels of success.

Finally, this study draws attention to avenues for future research. First, according to data availability, other dependent variables might be adopted, such as Tobin's q. Tobin's q provides a ratio of market value over the replacement value of tangible assets, and in so doing may partially reduce the distortions associated with MTB, though may not represent an accurate measure of IC value. Second, additional sources of information available to financial investors regarding company intangibles investment policies (including narrative disclosures) might be explored, thus adopting a broader mixed methods perspective. Third, the methodological approach adopted in this paper may be replicated in an international comparative context for samples of listed firms.

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Table I. Sample selection

Sample reduction action	Number of firms
Population of Italian listed firms on the Italian Stock Exchange in 2013	232
Firms not listed in 2009	(26)
Firms with missing market values in 2009	(23)
Firms with missing financial and/or governance data	(43)
Final firm sample (balanced)	**140**
Total firm-year observations (balanced sample)	**700**

Table II. Sample firm industry classification NACE Rev. 2 (2-digit code)

NACE code	N.	NACE code	N.
10	3	43	4
11	1	46	9
13	1	47	3
14	2	49	2
15	3	50	1
18	1	52	3
19	1	56	1
20	1	58	5
21	1	59	4
23	6	61	2
25	2	62	7
26	5	64	7
27	7	68	3
28	10	70	15
29	3	72	2
30	2	73	1
31	1	77	1
32	2	79	2
35	5	82	1
36	1	85	1
38	1	93	2
39	1	96	1
41	1	**Total**	**140**
42	2		

Table III. KIBS firms (25 companies = 125 firm-year observations)

KIBS classification NACE Rev. 2	Description of section	Description of division	N.
NACE Code 62	Information and communication	Computer programming, consultancy and related activities	7
NACE Code 63	Information and communication	Information service activities	0
NACE Code 69	Professional, scientific and technical activities		0
NACE Code 70	Information and communication	Activities of head offices; management consultancy activities	15
NACE Code 71	Professional, scientific and technical activities	Architectural and engineering activities; technical testing and analysis	0
NACE Code 72	Professional, scientific and technical activities	Scientific research and development	2
NACE Code 73	Professional, scientific and technical activities	Advertising and market research	1
		Total KIBS companies	**25**
Sample firms: 25 KIBS industry firms (25/140= 17.86%) 115 TI firms 115/140= 82.14%)			

Table IV. Variable measurement

Variable label	Variable description	Expected sign	Hypothesis
Dependent variable:			
MTB	Market to book continuous dependent variable, computed as the mean of the beginning and the end value.		
Independent variables:			
$TINT_{i,t}$	Intangible assets, measured as intangible assets scaled by total assets at year t.	+	H1
$SIZE_{i,t}$	Firm size, measured as the natural logarithm of total assets at year t.	+	H2
$AGE_{i,t}$	The natural logarithm of the firm's length of establishment in years since its foundation date.	-	H3
$ROE_{i,t}$	Firm profitability, measured as the return on equity. ROE is net income scaled by equity at year t. The result is multiplied by 100.	+	H4
$DE_{.t}$	Firm leverage, measured in terms of the debt-equity ratio.	+	H5
Control variables:			
$AUDIT_{i,t}$	Auditor type dummy variable. The variable takes the value of 1 if the firm engages a Big 4 audit company audit company, and 0 otherwise.	+	
$OWN_{i,t}$	Ownership concentration proxied by the proportion of stock owned by individual investors and large-block shareholders. The dummy variable takes the value of 1 if such shareholders own at least the 50% of the voting rights, and 0 otherwise.	+	
$FAM_{i,t}$	Ownership concentration, proxied by family control and closely held ownership. The dummy variable equals 1 if at least 50% of the voting rights or outstanding shares are held either directly or indirectly by a family block holder, and 0 otherwise.	+	
$IND_{i,t}$	Industry type dummy variable which equals 1 if a firm is a KIBS industry firm, 0 otherwise. Firms are classified into KIBS industry or TI according to their two-digit NACE classification codes.	+	

Table V. Descriptive statistics for the continuous model variables (years 2009-2013)

Panel A – Full sample (Obs: 700 = 140 companies)

Variables	Mean	St. error	Median	St. dev.	Variance	Min	Max	25%	50%	75%
MTB	1.365	0.057	0.910	1.504	2.262	-1.187	10.218	0.522	0.910	1.773
TINT	0.068	0.005	0.012	0.122	0.015	0.000	0.668	0.001	0.012	0.070
SIZE	12.843	0.061	12.634	1.625	2.640	8.625	18.302	11.694	12.634	13.676
AGE	3.366	0.030	3.332	0.781	0.610	1.386	4.997	2.773	3.332	3.845
ROE	0.257	0.791	3.190	20.930	438.057	-143.140	70.380	-3.415	3.190	9.503
DE	0.970	0.201	0.410	5.317	28.271	-25.030	109.130	0.100	0.410	0.780

Panel B – Knowledge intensive business service industry (KIBS) firms (IND=1)- (Obs: 125 = 25 companies)

	Mean	St. error	Median	St. dev.	Variance	Min	Max	25%	50%	75%
MTB	1.749	0.17	1.34	1.85	3.43	-1.19	10.22	0.726	1.342	2.082
TINT	0.046	0.01	0.00	0.10	0.01	0.00	0.60	0.000	0.003	0.046
SIZE	12.834	0.16	12.93	1.81	3.28	9.28	16.83	11.463	12.928	14.103
AGE	3.047	0.08	2.83	0.86	0.74	1.61	4.87	2.398	2.833	3.401
ROE	-0.955	1.77	4.09	19.74	389.63	-94.47	34.69	0.010	0.150	0.530
DE	0.694	0.53	0.15	5.93	35.17	-23.77	59.84	0.726	1.342	2.082

Panel C – Traditional industry (TI) firms (IND = 0) – (Obs: 575 = 115 companies)

	Mean	St. error	Median	St. dev.	Variance	Min	Max	25%	50%	75%
MTB	1.281	0.06	0.86	1.40	1.97	-1.19	10.22	0.499	0.862	1.662
TINT	0.073	0.01	0.02	0.13	0.02	0.00	0.67	0.002	0.015	0.076
SIZE	12.846	0.07	12.61	1.58	2.51	8.62	18.30	11.726	12.610	13.628
AGE	3.436	0.03	3.37	0.75	0.56	1.39	5.00	2.996	3.367	3.892
ROE	0.520	0.88	3.08	21.19	448.89	-143.14	70.38	0.150	0.460	0.830
DE	1.030	0.22	0.46	5.18	26.81	-25.03	109.13	0.499	0.862	1.662

Note: This table reports the descriptive statistics of the dependent and independent variables in equation 5 and 6. 5%. Please. see Table 4 for variable measurement.

Table VI. Descriptive statistics for the dichotomous model variables

	Full sample (Obs: 700)				KIBS companies (Obs: 125)				TI companies (Obs: 575)			
	0		1		0		1		0		1	
Variables	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
AUDIT	81	11.6	619	88.4	17	13.6	108	86.4	64	11.1	511	88.9
OWN	300	42.9	400	57.1	75	60.0	50	40.0	225	39.1	350	60.9
FAM	540	77.1	160	22.9	105	84.0	20	16.0	435	75.7	140	24.3
IND	575	82.1	125	17.9	--	--	--	--	---	---	---	---

Table VII. Correlation matrix for full sample (700 observations)

	MTB	TINT	SIZE	AGE	ROE	DE	IND	AUDIT	OWN	FAM
MTB	1	0.224**	-0.043	-0.258**	0.349**	0.050	0.146**	0.078*	0.051	0.096*
		0.000	0.253	0.000	0.000	0.187	0.000	0.038	0.181	0.011
TINT	0.084*	1	-0.080*	-0.122**	0.094*	0.100**	-0.153**	-0.100**	0.108**	0.137**
	0.026		0.034	0.001	0.013	0.008	0.000	0.008	0.004	0.000
SIZE	-0.093*	0.036	1	0.090*	0.225**	0.005	0.010	0.286**	0.083*	-0.018
	0.014	0.342		0.017	0.000	0.889	0.784	0.000	0.028	0.632
AGE	-0.171**	-0.039	0.105**	1	-0.024	0.042	-0.206**	-0.024	0.039	-0.056
	0.000	0.298	0.005		0.531	0.266	0.000	0.525	0.307	0.136
ROE	0.165**	-0.046	0.160**	0.014	1	-0.002	-0.007	0.040	0.080*	0.036
	0.000	0.225	0.000	0.713		0.966	0.848	0.288	0.035	0.339
DE	0.213**	-0.022	-0.050	0.031	0.002	1	-0.221**	0.024	0.021	-0.078*
	0.000	0.555	0.188	0.414	0.963		0.000	0.524	0.583	0.038
IND	0.119**	-0.085*	-0.003	-0.191**	-0.027	-0.024	1	-0.030	-0.162**	-0.076*
	0.002	0.024	0.940	0.000	0.475	0.523		0.435	0.000	0.044
AUDIT	0.051	-0.014	0.282**	-0.031	0.017	-0.010	-0.030	1	0.057	0.016
	0.175	0.712	0.000	0.410	0.645	0.789	0.435		0.134	0.671
OWN	0.008	0.004	0.011	0.014	0.065	0.007	-0.162**	0.057	1	0.471**
	0.833	0.907	0.775	0.715	0.086	0.843	0.000	0.134		0.000
FAM	0.089*	-0.052	-0.048	-0.077*	-0.010	0.079*	-0.076*	0.016	0.471**	1
	0.018	0.170	0.207	0.042	0.785	0.036	0.044	0.671	0.000	

Note: This table reports the Pearson (Spearman) correlation coefficient for the model variables below (above) the diagonal. The asterisks indicate statistical significance at the following levels: ** = 1%; * = 5%.

Table VIII. Pooled regression model with the MTB ratio as dependent variable for the full sample (700 observations) NEW

Variables	Exp. sign	Coefficient	Std. Error	t	p-value	
			Model 1			
Constant		3.040	0.484	6.28	0.000	***
TINT	+	1.380	0.437	3.16	0.002	***
SIZE	+	-0.113	0.035	-3.26	0.001	***
AGE	-	-0.250	0.070	-3.56	0.000	***
ROE	+	0.014	0.003	5.40	0.000	***
DE	+	0.060	0.010	6.04	0.000	***
IND	+	0.464	0.143	3.25	0.001	***
AUDIT	+	0.392	0.173	2.27	0.024	**
OWN	+	-0.090	0.123	-0.73	0.463	
FAM	+	0.307	0.144	2.13	0.033	**
Year control:						
2010		0.149	0.167	0.89	0.373	
2011		0.057	0.167	0.34	0.732	
2012		-0.249	0.168	-1.49	0.138	
2013		0.121	0.168	0.72	0.471	

Model specification (model 1):	
Adj. R-square = 13.94%	F(13.686)= 9.71
R-squared = 15.54%	
Prob>F = 0.000	
Year control: Yes	
VIF < 2% for all variables	

Note: This table presents the results of the pooled panel regression model. The model is estimated for the full sample of 700 firm-year observations over the period 2009 to 2013. *MTB* = market to book ratio dependent variable; *AGE* = natural logarithm of firm's length of establishment in years; *DE* = debt-equity ratio; *OWN* = ownership concentration dummy variable; *FAM* = family ownership concentration dummy variable; *TINT* = total intangibles assets; *SIZE* = natural logarithm of total assets; *IND* = industry type dummy variable (see table 2); *ROE* = return on equity ratio; *AUDIT* = auditor type dummy variable; and ε = model error term. The asterisks indicate statistical significance at the following levels: *** = 1%; ** 5%; * = 10%.

Table IX. Pooled regression model (Robustness tests) (Obs: 700)

Variables	Exp. sign	Model 2			Model 3			Model 4			Model 5		
		Coeff.	p-value		Coeff.	p-value		Coeff.	p-value		Coeff.	p-value	
Constant		2.816	0.000	***	3.692	0.000	***	3.474	0.000	***	3.282	0.000	***
TINT	+	1.229	0.006	***	1.594	0.004	***	1.506	0.007	***	1.234	0.005	***
SIZE	+	-0.096	0.008	***	-0.160	0.000	***	-0.141	0.002	***	-0.109	0.002	***
AGE	-	-0.246	0.001	***	-.0268	0.003	***	-0.270	0.003	***	-0.296	0.000	***
ROE	+	---	---		0.009	0.008	***	---	---		0.014	0.000	***
ROA	+	0.949	0.111		---	---		0.022	0.976		---	---	
DE	+	0.061	0.000	***	0.578	0.001	***	0.026	0.040	**	0.060	0.000	***
IND	+	0.490	0.001	***	0.614	0.005	***	0.567	0.002	***	---	---	
AUDIT	+	0.383	0.031	**	0.021	0.894		0.592	0.007	***	0.371	0.033	**
OWN	+	-0.047	0.704		0.257	0.159		0.051	0.741		-0.141	0.249	
FAM	+	0.260	0.077	*	0.578	0.001	***	0.236	0.198		0.296	0.042	**
Year control:													
2010		0.173	0.309		-0.141	0.504		-0.122	0.567		0.155	0.358	
2011		0.076	0.656		-0.511	0.016	**	-0.500	0.019	**	0.064	0.702	
2012		-0.261	0.127		-0.172	0.416		-0.183	0.389		-0.241	0.154	
2013		0.091	0.594		0.251	0.236		0.227	0.285		0.130	0.440	

Model specification (model 2):	Model specification (model 3):	Model specification (model 4):	Model specification (model 5):
Adj. R-square = 10.61%	Adj. R-square = 7.92%	Adj. R-square = 9.96%	Adj. R-square = 12.74%
R-squared = 12.27%	R-squared = 9.64%	R-squared = 8.69%	R-squared = 14.24%
Prob>F = 0.000	Prob>F = 0.000	Prob>F = 0.000	Prob>F = 0.000
F(13. 686)= 7.38	F(13. 686)= 5.63	F(13. 686)= 5.02	F(13. 686)=9.51
Year control: Yes	Year control: Yes	Year control: Yes	Year control: Yes
VIF < 2% for all variables	VIF < 2% for all variables	VIF < 2% for all variables	VIF < 2% for all variables

Note: This table presents the results of pooled panel regression model. The model is estimated for the full sample of 700 firm-year observations over the period 2009 to 2013. *MTB* = market to book ratio dependent variable; MTBya = market to book ratio dependent variable *one-year lag; AGE* = natural logarithm of firm's length of establishment in years; *DE* = debt-equity ratio; *OWN* = ownership concentration dummy variable; *FAM* = family ownership concentration dummy variable; *TINT* = total intangibles assets; *SIZE* = natural logarithm of total assets; *IND* = industry type dummy variable (see table 2); *ROE* = return on equity ratio; ROA = Return on assets ratio; *AUDIT* = auditor type dummy variable; and ε = model error term. The asterisks indicate statistical significance at the following levels: *** = 1%; ** 5%; * = 10%. Variations in the model 1: Model 2 uses MTB ratio (year t) as dependent and ROA to gauge firm profitability. Model 3 uses MTB ratio (one-year lag) as dependent and ROE to gauge firm profitability. Model 4 uses MTB ratio (one-year lag) as dependent and ROA to gauge firm profitability. Model 5 uses MTB ratio (year t) as dependent variable and the control variable *IND* is removed.