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Intellectual capital, growth opportunities, and financial performance in European firms: Dynamic panel data analysis

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Dynamic panel data analysis

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Abstract

Purpose – The purpose of this paper is twofold: first, to analyse the impact of intellectual capital (IC) and growth opportunities on firms' financial performance as well as the moderating effect of IC on the relationship between growth opportunities and financial performance; and second, to analyse the impact of IC on growth opportunities.

Design/methodology/approach – The current study uses a sample of non-financial listed firms consisting of 14 Western European countries for the period between 2004 and 2015. The estimation method used is specifically the Generalised Method of Moments system (1998) estimator, a dynamic panel estimator.

Findings – The results reveal that the IC efficiency of the current period has a positive impact on the financial performance of high-, medium- and low-tech European firms. A non-linear relationship was found between growth opportunities and financial performance. Also, findings suggest that the positive relationship between growth opportunities and financial performance is enhanced with the efficient use of firms' IC. Results indicate that the efficient use of IC in the current period has a greater impact on growth opportunities in high firms. Additionally, results reveal the presence of a non-linear relationship between ownership concentration and growth opportunities.

Originality/value – The current study contributes to the current literature by exploring a sample of firms across Western European countries, which is divided among high-, medium- and low-tech firms. The econometric modelling enables the author to conduct a longitudinal study.

Keywords Financial performance, Intellectual capital, Ownership concentration, Growth opportunities

Paper type Research paper

1. Introduction

In a knowledge-based economy, intellectual capital (IC) is recognised as a source of firms' growth, innovation and competitive advantage (Lev, 2004). The European Union (EU) acknowledges that innovations and the human factor—IC—can be seen as the main drivers of countries and firms' future growth as well as individuals' development (OECD, 2013). Therefore, the EU defined the smart growth as one of the main priorities in the Europe 2020 strategy (Veugelers *et al.*, 2015), i.e., economic growth based on innovation and knowledge.

IC is a key resource for firm's value creation process and to create sustainable competitive advantages (Holland, 2006; OECD, 2013). Despite the recognition of the importance of IC for firms' future growth, contributing to growth opportunities, the innovation environment in the EU remains weak (Cincera *et al.*, 2015). The access to external finance and the recent economic crisis accentuated the scarcity of financial resources, mainly to fund investments in intangible assets, such as IC (Cincera *et al.*, 2015; Hall *et al.*, 2016). Therefore, in order to incentivize innovation, the EU has made efforts to fund innovation through projects such as the Horizon 2020 strategy (Veugelers *et al.*, 2015). IC investments, often referred to as intangible assets, are claims of future benefits, which do not have physical or financial form (Lev, 2004) and strongly contribute to value creation

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through employees' knowledge, organisational processes and innovation and relationships (Serenko and Bontis, 2004; Wang *et al.*, 2014; Youndt *et al.*, 2004).

In spite of the results of several studies (Bontis, 1998; Denicolai *et al.*, 2015; Nimtrakoon, 2015; Tseng *et al.*, 2013; ul Rehman *et al.*, 2011) that indicate a positive relationship between IC and financial performance, the difficulties in valuating IC investments increase agency costs due to the information asymmetry (Aboody and Lev, 2000; Lev, 2004; Lev and Zambon, 2003). Aboody and Lev (2000) suggested that information asymmetry between a firm's insiders and outsiders worsens in firms with high IC investments, due to assets' specificity. This specificity of IC investments may create adverse selection, moral hazard and opportunistic behaviour by managers (Aboody and Lev, 2000; Holland, 2006). On the one hand, ownership concentration may block the entrance of highly qualified and trained managers (Greco *et al.*, 2014; Miller and Le Breton-Miller, 2006; Westhead and Howorth, 2006), due to the lack of willingness to share control. On the other hand, agency problems might be solved due to the alignment of interests between owners and managers (Lemmon and Lins, 2003). Previous empirical evidence shows contradictory results (Baber, Janakiraman, and Kang, 1996; Baker, 1993; Hutchinson, 2002; Hutchinson and Gul, 2004; Muniandy and Hillier, 2015; Serrasqueiro *et al.*, 2007). Thus, ownership concentration may influence negatively or positively firm's financial performance and growth opportunities.

Various authors (Abdolmohammadi, 2005; Tan *et al.*, 2007; Zéghal and Maaloul, 2010) conclude that the effect of IC on firms' financial performance depends on the industry sector and that IC investments influence the level of growth opportunities (Sudarsanam *et al.*, 2006). The current study differs from previous studies about the impact of IC on firms' financial performance (Bontis, 1998; Denicolai *et al.*, 2015; Nimtrakoon, 2015; Tseng *et al.*, 2013; ul Rehman *et al.*, 2011), as it analyses the relationships between IC, growth opportunities and firms' financial performance in Western European high-tech, medium-tech and low-tech firms. Therefore, this study seeks to contribute to the current literature by addressing the following objectives: to analyse the impact of IC and growth opportunities on firms' financial performance as well as the moderating effect of IC on the relationship between growth opportunities and financial performance; and to analyse the impact of IC on growth opportunities.

Based on a sample of non-financial listed firms in 14 Western European countries for the period between 2004 and 2015, we defined high-tech, medium-tech and low-tech sub-samples following Ortega-Arguiles *et al.* (2009). For the second part of the study, following the criteria of Moncada-Paternò-Castello (2016), we grouped the whole sample into high- and low-tech sectors. The current study uses econometric modelling techniques, resorting specifically to the Generalised Method of Moments (GMM) system (1998) estimator to analyse dynamic panel data. The results reveal that IC efficiency of the current period has a positive impact on the financial performance of high-tech, medium-tech and low-tech European firms. The results indicate the non-linearity of the relationship between growth opportunities and financial performance. The findings of the current study also suggest that the positive relationship between growth opportunities and financial performance is enhanced with the efficient use of firms' IC. The financial crisis of 2008–2009 had a negative effect on financial performance in high-tech and medium-tech firms. The findings indicate that the efficient use of IC in the current period has a greater impact on growth opportunities in high-tech firms. Finally, results reveal the non-linearity of the relationship between ownership concentration and growth opportunities.

The current paper is structured as follows. In Section 2, we present the theoretical framework and hypotheses formulation; the methodology is described in Section 3; in Section 4, we present the results; Section 5 discusses the results; and finally, Section 6 presents the conclusion and implications.

2. Literature review and hypotheses development

2.1 IC concepts

Intangible assets, such as IC, are claims of future benefits, which do not have physical or financial form (Lev, 2004). Investment in intangible assets contributes greatly to firms' market value, representing the part of firms' growth opportunities (Myers, 1977) which are beyond assets in place (Lev and Radhakrishnan, 2003).

IC is an emerging and fast-evolving concept (Ilyin, 2014). However, the characteristics of IC, i.e., a multidisciplinary and interdisciplinary concept (Bontis, 1999; Marr and Chatzkel, 2004; Morariu, 2014), allow researchers to adopt different nomenclatures and terminologies (Bontis, 2001) and, therefore, there is no agreement on a generally accepted definition (Marr, 2007). Bontis *et al.* (1999, p. 397) defined IC as the collection of intangible resources and their flows. According to Stewart (1997, p. 11), IC is "intellectual material—knowledge, information, intellectual property, experience—that can be put to use to create wealth. It is a collective brainpower". Edvinsson and Malone (1997, p. 44) defined IC as "the possession of knowledge, applied experience, organizational technology, customer relationships and professional skills that provide the firm with a competitive edge in the market". Also, IC has been pointed out as a possible explanation for the gap between firms' book value and market value (e.g. Edvinsson and Malone, 1997; Lev, 2001, 2004; Ordoñez de Pablos, 2005). Since there is no consensus on the definition of IC, in this study, IC represents the knowledge-based activities and processes that contribute to firms' innovation, value creation, competitive advantages and future benefits by adding value for firms' stakeholders.

IC can be decomposed into components, i.e., human capital, structural capital and relational capital, which are widely accepted among researchers (Bontis *et al.*, 2015; Edvinsson and Malone, 1997; Nimtrakoon, 2015; Sveiby, 1997; Sydler *et al.*, 2014; ul Rehman *et al.*, 2011; Wang *et al.*, 2014). Moreover, human capital refers to the sum of employees' knowledge, competence, innovativeness, commitment and wisdom (Bontis, 1998; Johnson, 1999; Morris, 2015). This is the individual's knowledge that does not belong to the firm and that employees take with them when they leave the organisation.

Structural capital comprises the firm's most valuable strategic assets, such as organisational capabilities, culture, processes, patents, copyrights, trademarks, databases and so on (Denicolai *et al.*, 2015; Janosevic and Dzenopoljac, 2012; Johnson, 1999). Structural capital is more specialised than the other IC components (Hejazi *et al.*, 2016). This capital can be seen as the basic structure of a firm that supports and empowers human capital (Bontis, 1998; Curado *et al.*, 2011). Furthermore, structural capital is considered the support infrastructure for the establishment and maintenance of relationships with key external stakeholders (Molodchik *et al.*, 2014; Schiuma and Lerro, 2008).

Relational capital is the knowledge obtained through the establishment, maintenance and development of relationships with external stakeholders (Johnson, 1999; Kweh *et al.*, 2014; Yu *et al.*, 2015). Relational capital comprises employees' knowledge, organisational processes, innovation capabilities, research and development (R&D) projects, brand and relationships (Johnson, 1999; Serenko and Bontis, 2004; Wang *et al.*, 2014; Youndt *et al.*, 2004). This capital enhances and influences external stakeholders' perceptions of the firm (Bontis *et al.*, 2015; Cabrita and Bontis, 2008; Ting and Lean, 2009).

In spite of the importance of IC in firms' value creation, firms that strongly embody intangible assets in their activities see their degrees of investment sunkness increase (Lev and Zambon, 2003). This fact makes it difficult to identify and measure the value of IC, and therefore financial statements fail in reporting IC's value (Lev, 2004; Nimtrakoon, 2015). Several authors provided an overview of IC valuation models (Bontis, 2001; Sveiby, 1997; Sydler *et al.*, 2014). Until now, there has been no single, generally accepted model to measure IC. One of the most adopted methods among researchers is the Value Added Intellectual Coefficient (VAIC™) model (e.g. Bontis *et al.*, 2015; Chang and Hsieh, 2011; Janosevic and

Dzenopoljac, 2012; Morariu, 2014; Nimtrakoon, 2015; Ting and Lean, 2009). The model developed by Pulic (1998, 2000) allows managers, shareholders and other interested stakeholders to monitor and measure firms' IC performance and potential. In other words, VAIC^{TM} measures intellectual efficiency in firms' value creation through exploiting their economic resources (Pulic, 2004).

Despite several authors criticising the model (cf. Andriessen, 2004; Iazzolino and Laise, 2013; Maditinos *et al.*, 2011; Ståhle *et al.*, 2011), several advantages of VAIC™ are pointed out. It treats human capital as the most valuable source of IC (Greco *et al.*, 2014; Mondal and Ghosh, 2012). The data used to compute the value of VAIC™ come from financial statements, and therefore, the data are authentic and audited (Clarke *et al.*, 2011; Firer and Williams, 2003; Pulic, 1998, 2000). VAIC^{TM} is more objective, verifiable and quantitative (Firer and Williams, 2003; Pulic, 1998, 2000). This model is easy, simple, straightforward to compute (Firer and Williams, 2003; Nimtrakoon, 2015), better for statistical analysis (Andriessen, 2004) and appropriate for cross-sectional comparisons, i.e., comparisons across multi-national and multi-industry companies (Chen *et al.*, 2014; Firer and Williams, 2003; Nimtrakoon, 2015; Young *et al.*, 2009). According to Firer and Williams (2003), the other models of IC measurement developed are customised to fit a specific firm's profile, which limits comparability. Furthermore, Clarke *et al.* (2011) argued that the required information is not available to those outside the firm and the often-qualitative information, which is based on judgements, cannot be translated into monetary value.

Therefore, this study will use VAIC^{TM} to measure IC. Besides the fact that VAIC^{TM} has been widely adopted by researchers, according to Zéghal and Maaloul (2010), VAIC^{TM} is used by the UK's Department for Business, Innovation and Skills as the indicator of firms' IC, which contributes to the validity of the VAIC^{TM} model.

2.2 IC, growth opportunities and financial performance

Despite the existence of various studies showing a positive and significant effect of IC on firms' financial performance, using VAIC™ as a measure of the efficiency of IC, there are several studies that did not find the same direction in that referred relationship, which may be attributed to country or industry specificities (Bontis, 1998; Chen *et al.*, 2005; Denicolai *et al.*, 2015; Nimtrakoon, 2015; Tseng *et al.*, 2013; ul Rehman *et al.*, 2011). Riahi-Belkaoui (2003) used a sample of US multi-national firms to examine the association between IC and firms' financial performance, the results indicating a positive relationship. Chen *et al.* (2005) analysed the impact of IC on firms' financial performance of Taiwanese listed firms. The results show a positive and significant relationship between IC and firms' financial performance and may indicate benefits in future performance.

Zéghal and Maaloul (2010) analysed the impact of IC on firms' financial performance for three groups of industries, i.e., high techs, traditional and services and identified a positive impact of IC on firms' financial performance for firms, irrespective of the industry sector. In another study, Tan *et al.* (2007) analysed the effect of IC on firms' financial performance across different industries. Based on Singaporean listed firms, their findings show that the positive association between IC and firms' financial performance varies across industries. Based on 15 companies on the Belgrade Stock Exchange, the results of the study by Janosevic and Dzenopoljac (2012) study revealed that IC has a positive impact on return on equity and a strong impact on employee productivity, but not on return on assets. Based on a large sample of manufacturing firms in Thailand, Phusavat *et al.* (2011) found a significant, positive relationship between IC and firms' financial performance.

Rahman (2012) studied 100 listed firms, located in the UK, and concluded that a higher value of IC increases firms' financial performance. Tseng *et al.* (2013) used a sample of Taiwanese IT listed firms, the results indicating a significant, positive relationship between IC and firms' financial performance. Differing from previous studies, Morariu (2014) used a

sample of Romanian firms to analyse the association between IC and firms' financial performance. The results show a significant, negative relationship between IC and firms' financial performance. Using a sample of listed firms in ASEAN countries, the results of Nimtrakoon (2015) reveal that the effect of IC on firms' financial performance is significant and positive for all countries.

According to the above, we propose the following hypotheses:

H1. IC has a positive impact on firms' financial performance.

H1a. IC has a positive impact on the financial performance of high-tech firms.

H1b. IC has a positive impact on the financial performance of medium-tech firms.

H1c. IC has a positive impact on the financial performance of low-tech firms.

IC provides firms with innovative capacity to the firms (Chen *et al.*, 2005; Lev and Sougiannis, 1996). This innovative capacity is recognised as a source of value creation and firms' growth. However, the investment in intangible assets increases investor's perception of risk due to the information asymmetry (Barth and Kasznik, 1999; Myers, 1984), as managers can act in order to maximise their own utility due to the discretionary expenditures of this type of investment (Gaver and Gaver, 1993; Hutchinson and Gul, 2004; Muniandy and Hillier, 2015). Some of these discretionary investments include expenses in advertising, marketing, R&D activities and product development (Adam and Goyal, 2008).

The capacity for innovation and expansion projects, through introducing new product lines, is greater in firms with growth options (Mason and Merton, 1985). Therefore, in the presence of growth opportunities, managers may invest in projects with a positive net present value as they contribute to increasing the firm's value (Myers, 1977). According to Myers (1977), the lower the value of assets in place, the greater are the growth opportunities or investment opportunity set (IOS).

Studies related to the relationship between growth opportunities or IOS and firms' financial performance are scarce. Results from prior research show a negative relationship between IOS and firms' financial performance (Baber, Janakiraman, and Kang, 1996; Baker, 1993; Hutchinson, 2002; Hutchinson and Gul, 2004). For example, based on a sample of 269 Australian publicly listed firms, Hutchinson (2002) found a negative relationship between IOS and firms' financial performance. In another study, Hutchinson and Gul (2004) also found a negative relationship between IOS and firms' financial performance. Despite the direction of the previous study's results, Muniandy and Hillier (2015) used a sample of 151 South African firms listed on the Johannesburg Stock Exchange, and identified a positive relationship between growth opportunities and firms' financial performance. Serrasqueiro *et al.* (2007) found a non-linear relationship between growth opportunities and profitability, using a sample of 39 firms listed on the Portuguese Stock Exchange. The results also suggested that firms with limited and high growth opportunities have greater profitability than firms with medium growth opportunities.

Based on the above-mentioned studies, and their contradictory results, we propose the following hypotheses:

H2. Growth opportunities have a positive effect on firms' financial performance.

H3. There is a non-linear relationship between growth opportunities and firms' financial performance.

H4. IC moderates the relationship between growth opportunities and firms' financial performance.

Growth opportunities seem to positively impact on firms' financial performance, contributing to firms' long-term sustainability. IC affects the dynamics of firm's growth

opportunities due to the capacity to produce technological innovations (Liu and Wong, 2011) through the investment in R&D activities (Chauvin and Hirschey, 1993; Chen *et al.*, 2005; Lev and Sougiannis, 1996). These investments imply to resort to some firm resources that do not have a physical or financial form (Lev, 2004), such as human capital. Nevertheless, these types of assets produce high returns, i.e., "In a sense, intangibles are high-risk/high-reward assets" (Lev, 2005). Therefore, IC enhances earnings dynamics (Liu and Wong, 2011). The study of Moncada-Paternò-Castello (2016) shows that in EU the investments in IC, especially in R&D, are much higher in medium high and high R&D sectors' groups. Firms from advanced technology sectors need to invest in their human capital as they are part of firms' core competencies. This way, firms can upgrade their technology skills and innovativeness, which is not easy to imitate by their competitors, and, therefore, they are able to develop new products and/or services (Prahalad and Hamel, 1990; Seyoum, 2004). Based on the above-mentioned, and considering VAIC™ as a measure of the efficiency of IC, we argue that high efficiency of IC positively impacts growth opportunities, thus we formulate the following hypothesis:

H5. Higher efficiency of firms' IC generates greater growth opportunities.

The principal–agent problem is classically associated with the dispersed ownership as described by Berle and Means (1932). This problem arises from the separation between firm's control and ownership (Jensen and Meckling, 1976), which leads to the conflict of interests between controlling and minority shareholders (Shleifer and Vishny, 1997). Managers that are not the firm's owners may adopt a behaviour influenced by self-interests. The selected projects that maximise the managers' interests may not maximise the firm's value and, therefore, may not converge with the interests of shareholders or owners (Berle and Means, 1932; Fama, 1980; Jensen and Meckling, 1976). Moreover, the opportunistic behaviour of managers derives from information asymmetries, as shareholders may have access to limited information (Jensen and Meckling, 1976).

With the monitoring of managers' actions, controlling shareholders can force the convergence of interests (Demsetz and Lehn, 1985; Shleifer and Vishny, 1997). Also, the interests of managers and shareholders can converge if managers participate in firm's ownership, reducing the agency costs (Jensen and Meckling, 1976; Leland and Pyle, 1977). Therefore, the higher the proportion of ownership, the higher the probability of managers to behave in order to increase firms' value. On the one hand, ownership concentration may reduce agency problems. On the other hand, the excessive ownership concentration may produce adverse consequences (Burkart, Gromb, and Panunzi, 1997), i.e. it could prevent investment opportunities exploitation.

Burkart *et al.* (1997) suggested the existence of a trade-off between control and initiative ability. Carlin and Mayer (2003) argued that different ownership structures may differ according to firms' characteristics and activities. In low-tech industries, the ownership concentration seems to contribute to long-term commitment with investments (Carlin and Mayer, 2003). Therefore, authors suggest that a more dispersed ownership structure may be applied to high-tech industries as it may be an incentive device for managers to act more efficiently due to delegate decision making (Burkart *et al.*, 1997; Prendergast, 2002). The delegation of the decision making might be more appropriate for uncertain environments (Prendergast, 2002).

Therefore, we argue that ownership concentration has a negative effect on growth opportunities.

Based on the above-mentioned, we formulate the following hypotheses:

H6. Ownership concentration has a negative effect on growth opportunities.

H7. The relationship between ownership concentration and growth opportunities is non-linear.

3. Data, variables and method

3.1 Database

This study uses a data set of 2,044 non-financial listed firms in 14 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and the UK) for the period between 2004 and 2015. The data set was gathered from the DATASTREAM database by Thomson Reuters as it provides current, historical economic and financial data for all listed firms in the world's major stock exchanges. All financial firms were excluded from the data set. The research sample has an unbalanced panel structure, where the number of firm-years presented in the research sample varies between 3 and 12. Following the suggestions of Guariglia (2008), Bond *et al.* (2003) and Cummins *et al.* (2006), the authors mitigate potential survivor bias by allowing the entrance and exit of firms. The data were trimmed at 1 per cent tails in order to control the potential effects of outliers, which may derive from particular events, such as large mergers, errors in coding or extraordinary firms' shocks.

Based on the criteria used by Ortega-Arguiles *et al.* (2009), it was used by the FTSE/Dow Jones Industry Classification Benchmark at the two-digit level, i.e., 45 industry and service sectors (see www.icbenchmark.com/), to classify industry and service sectors into high-tech, medium-tech and low-tech sectors. This classification will be considered to test *H1–H4*.

For the second part of this study, this study follows the criteria of Moncada-Paternò-Castello (2016), which divided medium-tech into medium high-tech and medium low-tech sectors. In order to divide the whole sample into two sub-samples, i.e., high- and low-tech sectors, the authors grouped medium high-tech to high-tech group and medium low-tech to low-tech group, which allowed to have two balanced groups in terms of number of firms. This classification will be used to test *H5–H7*.

3.2 Estimation method and variables measurement

Due to the dynamic character of the main research variables in the study, dynamic panel data econometrics is used, which allows the use of time series data taking into account the heterogeneity in adjustment dynamics between different types of firms. Therefore, GMM is used, which is a dynamic estimator proposed by Blundell and Bond (1998) that allows to control the endogeneity problem and avoids significant bias in estimates (Wooldridge, 2007). The efficiency of this estimator lies in the possibility to control the correlation errors over time and the heteroscedasticity across firms. The results from the GMM system (1998) estimator can only be valid under the following conditions: validity of the restrictions created by the use of instruments; and absence of second-order autocorrelation. In order to test the first condition, i.e., the validity of the restrictions created by the instruments used, this study uses the Hansen test where the null hypothesis is the validity of the restrictions created by the instruments used. For the second condition, the existence of second-order autocorrelation was tested, where the null hypothesis indicates that there is no second-order autocorrelation. In the case of not rejecting the null hypothesis for the Hansen and second-order autocorrelation tests, it is concluded that the GMM system (1998) estimator is valid and robust.

Through the use of a high number of instruments, the GMM system (1998) estimator leads to dramatically improvements in efficiency compared with the first-difference GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). Arellano and Bond (1991), Windmeijer (2005) and Ortega-Arguiles *et al.*, (2009) showed the reliability of the one-step estimator and asymptotic estimator to be more efficient than the two-step estimator due to the downward biased standard errors. In order to overcome this problem, Windmeijer (2005) developed the small sample corrector, which provides more accurate inference on the two-step procedure, especially for the GMM system (1998) estimator (Roodman, 2009). Therefore, this study uses the two-step procedure with the correction proposed by Windmeijer (2005).

The estimation models, i.e., Equation (1) will be used to verify *H1–H4* and Equation (2) will be used to verify *H5–H7*, are given by the following equations:

$$ROA_{i,t} = \propto_0 + \beta_1 ROA_{i,t-1} + \beta_2 VAIC_{i,t} + \beta_3 VAIC_{i,t-1} + \beta_4 TobinQ_{i,t} + \beta_5 TobinQ_{i,t}^2 + \beta_6 VAIC_{i,t} \times TobinQ_{i,t} + \beta_7 SIZE_{i,t} + \beta_8 AGE_{i,t} + \beta_9 Tlev_{i,t} + \beta_{10} Dcrisis_{08;09} + \varphi_c D_c + \varphi_t d_t + \eta_i + \varepsilon_{i,t}, \quad (1)$$

$$TobinQ_{i,t} = \propto_0 + \beta_1 TobinQ_{i,t-1} + \beta_2 VAIC_{i,t} + \beta_3 VAIC_{i,t-1} + \beta_4 OWNCONC_{i,t} + \beta_5 OWNCONC_{i,t}^2 + \beta_6 Cash\ Flow_{i,t} + \beta_7 Tlev_{i,t} + \beta_8 SIZE_{i,t} + \beta_9 AGE_{i,t} + \varphi_c D_c + \varphi_t d_t + \eta_i + \varepsilon_{i,t}, \quad (2)$$

where η_i are non-observable individual effects; $\varepsilon_{i,t}$ the error; d_t the year dummy variables; and D_c the country dummy variables.

The dependent variables used in this study were measured as follows: $ROA_{i,t}$ is the return on assets in the current period, given by the ratio of net profits in the current period to total assets in the current period and $TobinQ_{i,t}$ is used as a proxy for firms' growth opportunities in the current year, given by the ratio of equity market value in the current period to equity book value in the current period.

Next, the independent variables measures are presented: $ROA_{i,t-1}$ is the return on assets in the current period, given by the ratio of net profits in the previous period to total assets in the previous period; $TobinQ_{i,t-1}$ is used as a proxy for firms' market value in the previous year, given by the ratio of equity market value in the previous period to equity book value in the previous period; and $TobinQ_{i,t}^2$ is the square of $TobinQ_{i,t}$.

$VAIC_{i,t}$ is the Value Added Intellectual Coefficient in the current period (VAIC™) corresponding to the sum of HCE plus SCE plus CEE, where HCE is the human capital efficiency (HCE) = value added (VA)/human capital (HC); SCE structural capital efficiency (SCE) = structural capital (SC)/value added (VA); and CEE is the capital employed efficiency = value added (VA)/capital employed (CE). $VAIC_{i,t-1}$ is the Value Added Intellectual Coefficient in the previous period.

$OWNCONC_{i,t}$ is the ownership concentration in the current period, given by the variable NOSHEM (source: DATASTREAM database), which aggregates the percentage of holdings of 5 per cent or more by employees or family member, and $OWNCONC_{i,t}^2$ is the square of $OWNCONC_{i,t}$.

Finally, the measurement of control variables is as follows: $CashFlow_{i,t}$ is profitability in the current period, given by the ratio of earnings before interest and taxes in the current period to total assets in the current period; $Tlev_{i,t}$ is the leverage in the current period, given by the ratio of book value of total debt in the current period to total assets in the current period; $SIZE_{i,t}$ is the size in the current period, given by the natural logarithm of total assets in the current period; $AGE_{i,t}$ is firm age in the current period, given by the natural logarithm of the number of years of existence of the firm in the current period; and $Dcrise_{08;09}$ is a dummy representing crisis for the periods of 2008 and 2009. It assumes the value 1 if the year is equal to 2008 or 2009, and the value 0 for the remaining years in the study.

4. Empirical results

4.1 Descriptive statistics and correlation matrix

The descriptive statistics for the whole sample can be seen in Table I. It summarises the descriptive statistics of dependent and independent variables.

ROA presents a low mean score of 0.02, suggesting a low level of profitability. The high value of the standard deviation suggests the existence of high variance between firms. The mean score of *VAIC* is 2.1, suggesting that European firms create an average of 2.1 monetary unity for every 1 monetary unity utilised. The high value of *TobinQ* suggests that on average the firms' market value is higher than firms' book value, and therefore, the existence of growth opportunities in firms from European countries.

Table II reports the descriptive statistics based on sub-samples of high-tech, medium-tech and low-tech sectors.

Low-tech firms seem to be on average more profitable than medium-tech and high-tech firms. In fact, we see a negative low score mean of *ROA* for high-tech firms. Nevertheless, high-tech firms present higher growth opportunities than medium-tech and low-tech firms. Low-tech firms are more efficient in creating VA from their intellectual, physical and financial resources ($VAIC^{TM} = 2.4$) than medium-tech firms ($VAIC^{TM} = 2.2$) and high-tech firms ($VAIC^{TM} = 2.1$). Although the results seem surprisingly, Zéghal and Maaloul (2010) and UK DTI (2006, p. 51) in the "Value Added Scoreboard" found that in UK, traditional sectors create more VA, since these sectors are more modernised, innovative and competitive (DTI, 2006; Zéghal and Maaloul, 2010). Low-tech firms present a higher mean value of leverage than high-tech and low-tech firms. High-tech firms are younger and smaller than medium-tech and low-tech firms.

Table III reports the statistics descriptive based on sub-samples of high- and low-tech sectors.

It can be noticed that low-tech firms present on average higher values of *VAIC* than high-tech firms, which indicates that low-tech firms tend to be more efficient in creating more VA from their intellectual, physical and financial resources. High-tech firms present on average greater growth opportunities ($TobinQ_{i,t}$) and ownership concentration than low-tech firms. Also, high-tech firms show on average lower levels of leverage, which may be a result of unfavourable terms in accessing to credit. However, high-tech firms present on average greater levels of *CashFlow* than low-tech firms.

The correlation and magnitude of the variables in the study were analysed with Pearson correlation coefficient and can be seen in Table IV.

There are significant correlations between most pairs of variables. According to Aivazian *et al.* (2005) and Gujarati and Porter (2010), the problems of endogeneity between independent variables are relevant for correlation coefficients above 30 per cent. In this study, five correlations above 30 per cent among independent variables were found, which are *ROA* in the previous period with *VAIC* in the current and previous period, between *VAIC* in the current period and *VAIC* in the previous period and *CashFlow* with *TobinQ* in the current and previous period, respectively. Therefore, to overcome the problem of endogeneity, the GMM system (1998) dynamic estimator was applied, as it can use the instrumental variables to reduce the endogeneity problem. Also, high persistency was found in the correlation of dependent variables, *ROA* and *TobinQ*, between current and previous periods, due to the high correlation coefficients. This being so, in this study, the suggestions of Blundell and Bond

Table I. Descriptive statistics of full sample

Variables	Observations	Mean	Median	SD	Min.	Max.
$ROA_{i,t}$	21,188	0.017	0.035	0.12	−1.1	0.37
$VAIC_{i,t}$	17,940	2.3	2.1	1.3	0.0015	16
$TobinQ_{i,t}$	20,225	1.6	1.3	1.1	0.5	11
$Tlev_{i,t}$	21,395	0.23	0.21	0.18	0	1
$SIZE_{i,t}$	20,998	13	13	2.2	7.7	19
$AGE_{i,t}$	23,294	3.3	3.2	1.1	0.69	7.6

Table II.
Descriptive statistics of sub-samples

Variables	High-tech ($n = 457$ firms) Observations	Mean	Median	SD	Medium-tech ($n = 587$ firms) Observations	Mean	Median	SD	Low-tech ($n = 1{,}000$ firms) Observations	Mean	Median	SD
$ROA_{i,t}$	4,683	−0.011	0.034	0.17	6,196	0.021	0.038	0.11	10,309	0.028	0.034	0.095
$VAIC_{i,t}$	3,722	2.1	2,00	1.2	5,248	2.2	2	1.1	8,970	2.4	2.1	1.4
$TobinQ_{i,t}$	4,466	1.8	1.4	1.2	5,934	1.6	1.3	1	9,825	1.6	1.3	0.98
$Tlev_{i,t}$	4,793	0.16	0.13	0.16	6,247	0.23	0.21	0.16	10,355	0.26	0.26	0.18
$SIZE_{i,t}$	4,726	12	12	2.2	6,145	13	13	2	10,127	14	14	2.1
$AGE_{i,t}$	5,296	3	3	0.89	6,717	3.4	3.3	1.1	11,281	3.3	3.3	1.2

(1998) were followed and, therefore, it the GMM system (1998) dynamic estimator was applied, which is more appropriate to use here than the GMM (1991) estimator.

Next, results obtained using the GMM system (1998) dynamic estimator are presented. According to the results of the Hansen and second-order autocorrelation tests, the null hypothesis cannot be rejected in both tests for all estimations in this study. Therefore, the validity of the restrictions of the instruments used and the hypothesis of the existence of second-order autocorrelation for the estimated models are not rejected. This being so, the results of the GMM system (1998) dynamic estimator are robust and can be used to support the interpretation of the empirical results.

4.2 IC, growth opportunities and financial performance

The results obtained with the GMM system (1998) dynamic estimator for Equation (1) are presented in Table V.

For high-tech firms, the results show that *ROA* in the previous period, *VAIC*, *VAIC* in the previous period, *TobinQ*, *VAIC* × *TobinQ*, *SIZE* and *AGE* have a statistically significant positive impact on firms' financial performance. The square of *TobinQ*, *Tlev* and *Dcrisis* have a negative and statistically significant effect on firms' financial performance.

The results for medium-tech firms reveal that *ROA* in the previous period, *VAIC*, *Tobin*Q, *VAIC* × *TobinQ*, *SIZE* and *AGE* have a statistically significant positive effect on firms' financial performance, while *VAIC* in the previous period, the square of *TobinQ*, *Tlev* and *Dcrisis* have a statistically significant negative impact on firms' financial performance.

In the case of low-tech firms, the results indicate that *ROA* in the previous period, *VAIC*, *Tobin*Q, *VAIC* × *TobinQ*, *SIZE*, *AGE* and *Dcrisis* have a statistically significant positive impact on firms' financial performance. For *VAIC* in the previous period, the square of *TobinQ* and *Tlev*, the results indicate a statistically significant negative effect on firms' financial performance.

4.3 IC, growth opportunities and ownership concentration

The results obtained with the GMM system (1998) dynamic estimator for the estimated Equation (2) are presented in Table VI.

For high-tech firms, it can be noticed that the results indicate that *TobinQ* in the previous period, *VAIC*, *OWNCONC* and *CashFlow* have a statistically significant positive impact on firms' growth opportunities, whereas *VAIC* in the previous period, the square of *OWNCONC*, *Tlev* and *AGE* have a statistically significant negative effect on firms' growth opportunities.

The results reveal that for low-tech firms, *TobinQ* in the previous period, *VAIC* in the previous period, the square of *OWNCONC*, *CashFlow* and *Tlev* have a statistically significant positive impact on firms' growth opportunities, while *VAIC* in the current period, *OWNCONC* and *SIZE* have a statistically significant negative effect on firms' growth opportunities.

	High-tech ($n = 887$ firms)				Low-tech ($n = 1{,}157$ firms)			
Variables	*N*	Mean	Median	SD	*N*	Mean	Median	SD
$TobinQ_{i,t}$	8,830	1.7	1.4	1.1	11,395	1.6	1.3	0.99
$VAIC_{i,t}$	7,507	2.1	2	1.1	10,433	2.4	2.1	1.4
$OWNCONC_{i,t}$	9,145	17	0	23	11,796	15	0	24
$CashFlow_{i,t}$	8,858	0.13	0.11	0.08	11,686	0.12	0.11	0.078
$Tlev_{i,t}$	9,486	0.19	0.17	0.16	12,120	0.26	0.25	0.18
$SIZE_{i,t}$	9,258	12	12	2.1	11,740	14	13	2.1
$AGE_{i,t}$	10,221	3.2	3.1	1	13,073	3.3	3.2	1.2

Table III. Descriptive statistics of sub-samples

Table IV.
Correlation matrix

Variables	$ROA_{i,t}$	$ROA_{i,t-1}$	$VAIC_{i,t}$	$VAIC_{i,t-1}$	$TobinQ_{i,t}$	$TobinQ_{i,t-1}$	$OWNCONC_{i,t}$	$CashFlow_{i,t}$	$SIZE_{i,t}$	$AGE_{i,t}$	$Tlev_{i,t}$
$ROA_{i,t}$	1.0000										
$ROA_{i,t-1}$	0.6491**	1.0000									
$VAIC_{i,t}$	0.4096**	0.3539**	1.0000								
$VAIC_{i,t-1}$	0.3471**	0.4009**	0.6068**	1.0000							
$TobinQ_{i,t}$	0.1128**	0.0531**	0.1673**	0.1337**	1.0000						
$TobinQ_{i,t-1}$	0.1335**	0.1137**	0.1727**	0.1735**	0.8078**	1.0000					
$OWNCONC_{i,t}$	0.0011	−0.0000	−0.0611**	−0.0617**	−0.0445**	−0.0504**	1.0000				
$CashFlow_{i,t}$	0.2886**	0.2237**	0.2874**	0.2361**	0.5088**	0.4753**	−0.0231	1.0000			
$SIZE_{i,t}$	0.2420**	0.2528**	0.2003**	0.2116**	−0.1508**	−0.1296**	−0.2240**	−0.0778**	1.0000		
$AGE_{i,t}$	0.1176**	0.1160**	−0.0347**	−0.0315**	−0.1239**	−0.1276**	−0.0350**	−0.0641**	0.2282**	1.0000	
$Tlev_{i,t}$	−0.0411**	−0.0096	0.0237	0.0033	−0.1064**	−0.0101	0.0027	−0.1276**	0.1703**	0.0033	1.0000

Notes: **,***Statistically significant at the 5 and 1 per cent levels, respectively

Independent variables	Full sample	Dependent variable: $ROA_{i,t}$ High-tech—GMM (1998)	Medium-tech—GMM (1998)	Low-tech—GMM (1998)
$ROA_{i,t-1}$	0.26858*** (0.06349)	0.29274*** (0.02574)	0.37903*** (0.03534)	0.22393*** (0.03529)
$VAIC_{i,t}$	0.02236** (0.01110)	0.01202*** (0.00314)	0.03243*** (0.00550)	0.01005*** (0.00381)
$VAIC_{i,t-1}$	−0.00597*** (0.00200)	0.00988*** (0.00230)	−0.01748*** (0.00338)	−0.01446*** (0.00301)
$TobinQ_{i,t}$	0.03301** (0.01358)	0.03984** (0.01658)	0.02800*** (0.00756)	0.07481*** (0.01252)
$TobinQ^2_{i,t}$	−0.00441** (0.00174)	−0.01294*** (0.00226)	−0.00200** (0.00093)	−0.00747*** (0.00146)
$VAIC_{i,t} \times TobinQ_{i,t}$	0.01018** (0.00425)	0.01345*** (0.00146)	0.00556** (0.00231)	0.00669** (0.00307)
$Tlev_{i,t}$	−0.08241*** (0.01102)	−0.11513*** (0.02032)	−0.09428*** (0.00988)	−0.06738*** (0.00902)
$SIZE_{i,t}$	0.00335*** (0.00108)	0.00446*** (0.00107)	0.00190** (0.00075)	0.00384*** (0.00070)
$AGE_{i,t}$	0.00964*** (0.00143)	0.00581** (0.00269)	0.00380*** (0.00108)	0.00568*** (0.00108)
$Dcrisis_{08;09}$	−0.13775*** (0.02263)	−0.13752*** (0.02279)	−0.05634*** (0.01549)	0.01430*** (0.00288)
Constant	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	−0.13973*** (0.01851)
Observations	14,426	2,305	4,032	5,752
Number of ID	1,804	363	508	795
F (N(0,1))	83.21***	68.29***	91.08***	568.7***
Hansen (N(0,1))	41.47	84.36	75.38	45.08
$m1$ (N(0,1))	−8.046***	−3.505***	−6.053***	−5.780***
$m2$ (N(0,1))	1.563	1.190	0.430	1.799*

Notes: Standard errors in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table V.
Estimation results of Equation (1)

Independent variables	Dependent variable: $TobinQ_{i,t}$ High-tech—GMM (1998)	Low-tech—GMM (1998)
$TobinQ_{i,t-1}$	0.64703*** (0.02174)	0.65925*** (0.01790)
$VAIC_{i,t}$	0.02632** (0.01092)	−0.01321*** (0.00286)
$VAIC_{i,t-1}$	−0.02711*** (0.00753)	0.00765*** (0.00247)
$OWNCONC_{i,t}$	0.00609** (0.00301)	−0.00600** (0.00275)
$OWNCONC^2_{i,t}$	−0.00010** (0.00005)	0.00009** (0.00004)
$CashFlow_{i,t}$	2.27479*** (0.29829)	2.68236*** (0.12955)
$Tlev_{i,t}$	−0.11572** (0.05382)	0.09545*** (0.03478)
$SIZE_{i,t}$	0.00697 (0.00524)	−0.00879** (0.00402)
$AGE_{i,t}$	−0.02213* (0.01239)	−0.01640** (0.00721)
Constant	0.00000 (0.00000)	0.28305*** (0.09200)
Observations	3,246	4,43
Number of ID	503	657
F (N(0,1))	2,621.8***	991.6***
Hansen (N(0,1))	136.89	125.5
$m1$ (N(0,1))	−5.739***	−5.286***
$m2$ (N(0,1))	−1.619	−1.951*

Notes: Standard errors in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table VI.
Estimation results of Equation (2)

5. Discussion of the empirical results

The results from Equation (1) suggest that IC enhances firms' financial performance. *VAIC* in the current period has a positive impact on financial performance in high-tech, medium-tech and low-tech firms. Therefore, these results do not allow to reject *H1*. These results suggest that an efficient use of IC enhances firms' financial performance irrespective of the sector characteristics. The results obtained corroborate previous studies. (Chen *et al.*, 2005; Janosevic and Dzenopoljac, 2012; Phusavat *et al.*, 2011; Riahi-Belkaoui, 2003; Tan *et al.*, 2007). However, when the effect of *VAIC* in previous period on firms' financial performance

is observed, it can be noticed that *VAIC* only has a positive impact on the financial performance of high-tech firms. This may be due to the fact that high-tech firms are IC intensive. Therefore, the activities of those firms depend heavily on intangible resources, such as human capital, and apparently it takes time for these to impact on firm's financial performance (Prahalad and Hamel, 1990; Seyoum, 2004).

Concerning the relationship between growth opportunities and firms' financial performance, the results indicate that growth opportunities positively impact firms' financial performance. Therefore, the previously formulated *H2* cannot be rejected. This result corroborates the results of Muniandy and Hillier (2015). However, when the relationship between growth opportunities and firms' financial performance was tested, a non-linear relationship was found, which does not allow to reject *H3*. This result is in line with the previous findings of Serrasqueiro *et al.* (2007). The results suggest that, in the presence of growth opportunities, managers decide to implement, to a certain extent, projects with a positive net present value. However, the non-linearity of the relationship between growth opportunities and firms' financial performance suggests that from a certain level of growth opportunities, managers tend to select non-profitable projects. Therefore, this may increase agency problems and discretionary expenditure, even in the presence of high-tech growth opportunities (Gaver and Gaver, 1993; Hutchinson and Gul, 2004; Muniandy and Hillier, 2015). This seems to have negative consequences for the relationship between growth opportunities and financial performance.

The results suggest that the positive relationship between growth opportunities and firms' financial performance is enhanced with the efficient use of firms' IC. Therefore, it is not possible to reject the previously formulated *H4*. IC provides firms with innovative capacity (Chen *et al.*, 2005; Lev and Sougiannis, 1996), which is recognised as a source of firms' value creation and growth. Therefore, firms can upgrade their technology skills and innovativeness, which is not easy to imitate by their competitors, and therefore, they are able to develop new products and/or services (Prahalad and Hamel, 1990; Seyoum, 2004). Thus, the results obtained here suggest a positive influence of IC, since it enhances the positive relationship between growth opportunities and firms' financial performance.

Concerning the impact of the 2008–2009 crisis on firms' financial performance, the results show for high-tech and medium-tech firms that the crisis had a negative impact on performance. This period may have limited the access to external finance and accentuated the scarcity of financial resources as well as deteriorating terms of credit, mainly for funding investments in intangible assets, such as IC (Cincera *et al.*, 2015; Hall *et al.*, 2016). This is in line with the results obtained in this study regarding the negative relationship between leverage and firms' financial performance. The higher negative coefficient of leverage in the case of high-tech firms suggests greater difficulties for these firms, namely, unfavourable terms, in accessing credit than for medium-tech and low-tech firms.

According to the results obtained for Equation (2), the efficient use of IC in the current period has a positive impact on growth opportunities in high-tech firms and negative impact on growth opportunities in low-tech firms. Therefore, *H5* is rejected. These results suggest that low-tech firms do not depend on IC efficiency as much as high-tech firms do, given that advanced technology sectors need to invest in their human capital that is part of firms' core competencies, and therefore, upgrade firms' technology skills and innovativeness (Prahalad and Hamel, 1990; Seyoum, 2004).

The results obtained suggest that ownership concentration positively affects growth opportunities in high-tech firms but not in low-tech firms. Therefore, it is needed to partially reject *H6*. After testing for the possibility of non-linear relationship between ownership concentration and growth opportunities, results show a non-linearity of the referred relationship. This being so, *H7* cannot be rejected. This result suggests that for

greater levels of growth opportunities, a low ownership concentration brings benefits to the firm as a more dispersed ownership structure may be an incentive device for managers to act more efficiently due to delegate decision making, which might be more appropriate for uncertain environments (Burkart *et al.*, 1997; Prendergast, 2002). While for the case of low-tech firms, the greater level of ownership concentration seems to negatively impact growth opportunities, in spite of high ownership concentration tends to assure the convergence of interests between managers and shareholders. Furthermore, the higher the proportion of ownership, the higher the probability of managers to behave in order to increase firms' value due to the reduction of agency problems (Jensen and Meckling, 1976; Leland and Pyle, 1977).

Results from Equation (2) also reveal a negative relationship between *Tlev* and growth opportunities for high-tech firms and positive for low-tech firms. This result suggests that firms that strongly embody intangible assets in their activities see the degrees of sunkness of their investments increase (Lev and Zambon, 2003). Additionally, intangible assets do not have a physical or financial form (Lev, 2004), which deteriorates the terms for high-tech firms to access to credit. Therefore, high-tech firms strongly rely on internally generated funds to finance their activities (Myers, 1984; Myers and Majluf, 1984), which is confirmed by the positive relationship between *CashFlow* and growth opportunities from Equation (2).

6. Conclusion

The efficient use of IC seems to positively impact firms' growth opportunities, and, consequently, both contribute to firms' financial performance. Additionally, the correct management of IC will increase firms' wealth and growth. The selection of an optimal ownership structure appears to influence the firms' innovativeness, technological capacity as well as the employees' creativity.

Based on a sample of non-financial listed firms in 14 Western European countries for the period between 2004 and 2015, the sample was divided according to R&D intensity sectors. Resorting to econometric modelling techniques, specifically, the GMM system (1998) estimator, in this study, panel data of a dynamic model were analysed.

The findings show that IC efficiency in the current period has a positive impact on the financial performance of high-tech, medium-tech and low-tech firms. However, when the impact of IC efficiency of the previous period on financial performance was tested, only financial performance of high-tech firms benefits from IC efficiency. The results reveal the non-linearity of the relationship between growth opportunities and firms' financial performance. This non-linear relationship suggests that for a greater level of growth opportunities, managers tend to select non-profitable projects, which may be a consequence of the increase of agency problems and discretionary expenditures in firms with high growth opportunities. Also, the results suggest that the positive relationship between growth opportunities and firms' financial performance is enhanced with the efficient use of firms' IC.

The financial crisis of 2008–2009 has a negative effect on financial performance in high-tech and medium-tech firms. In the crisis period, this type of firm may face restrictions in accessing to credit, suffer a scarcity of financial resources or unfavourable terms of credit, mainly for funding investments in intangible assets, such as IC.

Findings also reveal that the efficient use of IC in the current period has greater impact on growth opportunities in high-tech firms. The results reveal that the relationship between ownership concentration and firms' growth opportunities is non-linear. Regarding the ownership structure impact on firms' growth opportunities, results suggest that for high-tech firms, a low ownership concentration brings benefits to the firm, as a more dispersed ownership structure may be an incentive device for managers to act more efficiently due to delegate decision making, which might be more appropriated for uncertain environments.

While for the case of low-tech firms, the greater levels of growth opportunities seem to be associated with higher ownership concentration, which allows a convergence of the interests of shareholders and managers due to the reduction of agency problems.

The current study presents several contributions. To authors' knowledge, this is the first study exploring a sample of Western European countries. A panel data analysis was applied resorting to econometric models, using the GMM system (1998) estimator. Results suggest the importance of IC for firms' financial performance irrespective of being high-tech, medium-tech or low-tech firms. This study shows that IC has a positive effect on the relationship between growth opportunities and firms' financial performance. Moreover, findings show that there is a non-linear relationship between growth opportunities and firms' financial performance. Results reveal that IC positively impacts firms' growth opportunities. Findings also contribute by analysing the relationship between the impact of ownership concentration on firms' growth opportunities as well as by showing the existence of a non-linear relationship between ownership concentration and firms' growth opportunities.

On the practical side, it is encouraged that managers pay more attention to the importance of firms' IC, as this has a positive impact on firms' financial performance and exploitation of growth opportunities. Therefore, it is important to understand that the characteristics of firms may require different styles of IC management. For policy makers, the creation and development of incentive programmes to help firms to fund IC is suggested, considering that high-tech firms have much more difficulty in accessing credit.

The current study has the following limitations. As it uses a sample of 14 Western European countries, the differences between high-tech and low-tech firms for individual countries were not analysed, which limits the extrapolation of the results to a particular country. Therefore, it would be interesting to see if the results obtained hold in individual countries. Countries' characteristics, such as legal aspects, accounting practices or industrial sectors, may influence results. For future research, the authors suggest longitudinal studies comparing Western European countries. Also, it is important to analyse firms' financial decisions regarding IC investment, as IC contributes to their financial performance and growth opportunities.

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