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The effect of intangible assets on sustainable growth and firm value – Evidence on intellectual capital investment in companies listed on Bucharest Stock Exchange

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Abstract

Purpose – The present study investigates the connection between company investments in intellectual capital (IC) and how they translate into financial value. The aim is to test the impact of intangible assets on the firm value and its sustainable growth.

Design/methodology/approach – The research employs computation models to determine the sustainable growth rate (SGR) and the firm value (FV), and by using the ordinary least squares (OLS) model through a linear regression assesses the relationship between the dependent variables and expenditures on intangibles like R&D, IT programs and patents. A sample of 42 companies has been selected out of the 78 listed at Bucharest Stock Exchange (BSE), based on the appropriateness of the information disclosed in the financial reports for the period 2016–2019.

Findings – The results show that intangibles classified as innovative competences (R&D and Patents) do not have a positive impact on SGR and FV in listed companies from Romania. Moreover, R&D has a negative and significant effect on FV, while IT Programs have a positive and significant impact on FV, but not on the SGR. Variables categorised as economic competencies (Brands, Shares held in associates and jointly controlled entities) and firm structure-specific variables (Leverage, Firm Performance) seem to have a significant effect on SGR and FV. Shares held in associates and jointly controlled entities is the variable that can have the biggest impact when it comes to FV for companies listed at BSE.

Research limitations/implications – Due to non-disclosure of specific information by some companies, or lack of investments in intangibles the sample had to be reduced and does not cover all listed companies.

Practical implications – Companies listed on the Regulated Market from the Bucharest Stock Exchange should maintain their scale of liabilities at a reasonable level when financing intangible assets in order to ensure corporate long-term and sustainable development. Also, these companies should maintain awareness about the importance of intangible assets and invest more in specific sub-components, in order to sustain competitive advantage. Recognizing the roles of intangibles, managers need to develop strategies to invest in profitable intangibles by reasonably allocating their limited resources, in order to achieve sustainable growth and increase company success.

Originality/value – Studies concerning the relation between investments in intangibles and sustainable growth rate and firm value of listed Romanian companies are very scarce. This paper reveals new research, never before undertaken, concerning expenditures on intangibles by Romanian companies and the valuation of such investments on Bucharest Stock Exchange.

Keywords Intangible assets, Sustainable growth, Firm value, Intellectual capital, Romanian listed companies

Paper type Research paper

1. Introduction

The emergence of new consumer segments and the liberalization of financial markets, coupled with a simultaneous growth for the globalization of markets and the development of large economic areas is an opportunity for growth for companies. The efficient use of all

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assets, both tangible and intangible, is vital to the effectiveness of the business and can result in a higher rate of return, but from a competitive perspective, things are different because only certain assets, namely those of strategic importance to the company, can be the source of competitive advantage, especially in the long run (Harasim, 2008). This objective can be achieved by effectively combining available, tangible and intangible resources.

Many authors consider intangible assets as critical resources for sustainable competitive advantage which is responsible for a company's financial and market performance (Shane and Klock, 1997; Augier and Teece, 2005; Cohen, 2005; Li *et al.*, 2010; Lin and Huang, 2011; Roulstone, 2011; Low and Lee, 2014; Ciftci and Zhou, 2016; Makrominas, 2017; Tahat *et al.*, 2018; Tahat *et al.*, 2016).

In order to identify and measure the intangibles and their contribution to a firm's performance and market value, various frameworks have been proposed, like the Intangible Assets Monitor (Sveiby, 1997); the Balance Score Card (Kaplan and Norton, 1996); Skandia Navigator (Edvinsson and Malone, 1997). Well-known monetary methods for assessing intangibles are Market-to-book value and Tobin's Q, Economic Value Added (EVA™) (Lev and Zambon, 2003). VAIC ^{TM} (Pulic, 2000), a widely used model, though sometimes criticized, has offered a clear means to calculate the Value Added Intellectual Coefficient to a company (Iazzolino and Laise, 2013). Nazari and Herremans (2007) extended the model to better measure the relation between intellectual capital components and financial performance.

Petty and Guthrie (2000, 2004) have noted that intellectual capital (IC) contributes to the generation of knowledge utilized to enhance the firm's value and to create competitive advantage (Petty and Guthrie, 2000, 2004). With the advent of the information society, there has been a switch from tangible to intangible resources, which have been referred to by some authors as IC investments (Sardo and Serrasqueiro, 2018). However, as Andreeva and Garanina (2016) have stated, in many emerging economies there is still a heavy dependency on natural or other tangible resources, as also confirmed by Iazzolino and Laise (2013) in what regards traditional industries, which rely mostly on physical capital.

Whereas there appears to be a general understanding on the main elements of the IC – human, structural and relational (Sveiby, 1997; Edvinsson and Malone, 1997; Johnson, 1999; Petty and Guthrie, 2000; Andriessen, 2004; Nazari and Herremans, 2007) – opinions vary when it comes especially to the intangible components which they comprise and how to assess them. Examples range from assets pertaining to intellectual property, to certain forms of knowledge such as organizational culture (Petty and Guthrie, 2000), shareholder relations (Johnson, 1999) or assets that have or do not have associated property rights (Corrado *et al.*, 2005).

Corrado *et al.* (2005, 2009) have investigated the change in the sources of economic growth that came with the ICT advancement, as reflected in the companies' spending on intangibles, which they classified in three main categories: computerized information, innovative property and economic competencies. The authors stated that any trimming of actual consumption with a view to expand future revenue streams qualifies as investment and no difference should be made between tangible and intangible capital in this respect (Corrado *et al.*, 2005, 2009).

In the last decades the number of studies trying to find an answer for the question of how intangible assets influence the performance of companies has increased. Most studies have shown that intangible assets have a positive effect on company performance (Olarewaju and Msomi, 2021; Del Monte and Papagni, 2003; Zhu and Huang, 2012). More recent researches (Xu and Wang, 2018; Ocak and Fındık, 2019) focused on the impact of IC and intangibles on the companies' sustainable growth rate and performance. Sewchurran *et al.* (2019) found that investments in intangibles by South-African companies with poor economic results encourage sustainable growth. There are also studies with contradictory findings even for sectors labelled as knowledge-intensive such as banking in Turkey (Ozkan *et al.*, 2016), India

(Oppong and Pattanayak, 2019), Columbia (Garcia Castro *et al.*, 2021) and China (Wang *et al.*, 2021), and thus it can be stated that there is no consensus in the literature on the effects that intangible asset may have on company performance (Lee and Shim, 1995; Morbey and Reithner, 1990). Difficulties can be found either in defining and measuring the results from the company's performance and intangible assets or from the way in which the literature regards the structure of a company's income.

According to Kafouros and Aliyev (2016) ownership of intangibles may stimulate growth in transition economies as those of former communist economies in Central and Eastern Europe with stronger institutional framework (e.g. regulative, normative), while in others this may not be true. In order to take advantage of their intangible assets, enterprises need to develop capabilities to transform them in better economic outputs.

The explanations for the contradictory results may also come from the complex nature of the relationship between intangible assets and performance, a relationship that covers concepts from different academic disciplines, so the existing literature lacks clarity in concept and methodology (Kancs and Siliverstovs, 2016; Nunes *et al.*, 2012; Chiesa *et al.*, 2009; Guan *et al.*, 2016). In addition, studies on this topic are found in journals belonging to different fields, thus making it difficult to understand how the same theoretical concepts appear in different subdomains.

The field literature has not yet sufficiently explored the impact of various intangible resources a company owns on its opportunities for growth and the firm value, even though important steps have been taken in this regard (Anagnostopoulou, 2008; Del Monte and Papagni, 2003; Lee, 2018). Existing literature has a limited focus and usually concentrates on specific topics such as R&D, firm performance, innovation activities and company growth (Teirlinck, 2017; Vrontis and Christofi, 2019). Moreover, no study investigated the impact that various intangible assets can have on the financial performance of listed companies that activate in Eastern Europe and specifically in Romania, while the number of studies on the IC topic in this area is limited. Existing reviews are characterized by fragmented knowledge, and the identified results do not have a theoretical integration and a systematic discussion.

Furthermore, as research on the impact of intangibles on sustainable growth and company value of Romanian companies is very scarce, this study aims to advance the knowledge in this area, by providing empirical evidence, based on data collected from corporate financial reports. In addition, unlike previous studies, a model for calculating the sustainable growth rate which focuses on intangibles' value is employed. In order to address the topic, the paper is organized as follows: in Sections 1 and 2 the general context and the relevant literature concerning the concepts are reviewed, and the hypotheses are developed; Section 3 presents the methods and the models used, and how the data has been collected; in Section 4 the results are presented and analysed; Section 5 comprises the discussion and the conclusions. It is envisaged that this research will be useful for various stakeholders, presumably shareholders, investors, academics and managers.

2. Literature review and hypotheses development

As previous studies have shown, the income reported by a company can be influenced by the use of different policies for the recognition of intangible assets (Lev and Zarowin, 1999; Canibano *et al.*, 2000; Gelb and Siegel, 2000; Lev, 2003; Chiang and Mensah, 2004; Siegel and Borgia, 2007; Skinner, 2008; Oliveira *et al.*, 2010; Han and Chuang, 2011; Alam *et al.*, 2014). Reviewing the extant literature on the intangibles, Canibano *et al.* (2000) revealed that current investments in intangibles, especially R&D, are tied to a higher future performance.

The increasing gap between a company's market and book values, which in turn caused a decline in the value relevance of accounting information, have drawn the attention of many researchers to investigate the unseen value omitted from the financial statements (Lev and

Zarowin, 1999; Lev, 2001; Swanson and Singer, 2002; Lev and Radhakrishnan, 2003). Lev (2001) indicated that nearly 80% of firm's market value was not shown in the financial statements. The recognition of intangible resources at real value has become a major issue, both financially and in terms of management. Nowadays, the economy is mainly based on intangible assets and, therefore, they must be recognized in the financial statements of companies, so that shareholders and investors have a clearer picture of the value of the company.

During the development of the IC research field, various authors have tried to identify those IC components that most contribute to a company's growth and financial performance, as the company strives to obtain valuable assets, to acquire new talent and to finance investments. There seems to be a general agreement that in the current digital economy enterprises rely more and more on investments in intangibles with the view to achieve business development. Corrado *et al.* (2005, 2009) proposed a classification of the sources of growth by types of intangibles spending, namely computerized information (software and databases), innovative property (R&D, mineral exploration, copyright and license costs and other expenses not leading to patents or copyrights) and economic competences (brand equity, firm specific human capital development and organizational structure related costs). In addition, Corrado and Hulten (2010) stated that a company's expenditures on intangibles can directly affect innovation and growth. These assertions have been re-enforced by recent studies.

Ocak and Fındık (2019) proved the existence of a positive relation between intangible assets, sustainable growth and firm value in Turkish listed companies, by employing sustainable growth rate (SGR) algorithms. Likewise, Xu and Wang (2018) demonstrated the direct impact of IC on financial performance and the companies' sustainable growth in the Korean manufacturing sector, by applying both the VAIC ^{TM} and the SGR model. An extensive study on US companies by Riahi-Belkaoui (2003) has indicated that enterprises having greater IC will exhibit higher market value. In a study that examines the impact of intangibles on firms' current and future financial and market performance, Tahat *et al.* (2018), using a sample of UK FTSE 150 non-financial firms, provide evidence about the role of intangible assets in enhancing firms' future financial performance and market performance. The paper shows positive associations between a firm's Good Will (brand) and R&D and future financial and market performance indicating that Good Will and R&D can contribute positively to earnings enhancement, and they are of interest when making investment decisions.

However, studies worldwide have tested the relationship between IC and firm value, as well as financial performance, with mixed results. On the one hand, a number of works have confirmed positive relations between IC or specific IC elements and company performance (Bontis, 1998). Positive and significant associations between intangibles and company value, performance and growth have been confirmed in various European areas by Sardo and Serrasqueiro (2017), Denicolai *et al.* (2015), Amin and Aslam (2017), Rahman (2012). In Finland, Rahko (2014) has demonstrated a significant effect of R&D and patents on the market value. In Asia, Chen *et al.* (2005) has found a direct association of IC and R&D expenditure with the market value and financial performance of companies listed in Taiwan. Xu and Sim (2018) have reached matching conclusions in respect of companies in China and South Korea, and Gamayuni (2015) in Indonesia. Chauvin and Hirschey (1993) have stated that advertising and R&D constitute investments in lucrative intangible assets that affect the shareholder value. In Australia, Nadeem *et al.* (2018) have demonstrated a direct relationship between IC efficiency and financial performance of publicly listed firms. Khalique and Bontis (2015) have found a positive association between IC and organizational performance in Pakistan. Smriti and Das (2018) have demonstrated a positive effect of IC on market value in Indian firms.

Other researches have proved the direct relation between IC and financial performance, by conducting studies focused on miscellaneous industries, with some variations (Tan *et al.*, 2007), in sectors such as manufacturing (Phusavat *et al.*, 2011), high tech enterprises (Zeghal and Maaloul, 2010; Wang *et al.*, 2014; Nimtrakoon, 2015), pharmaceuticals (Bollen *et al.*, 2005; Sharabati *et al.*, 2010), microfinance (Kamukami *et al.*, 2010), biotech companies (Guo *et al.*, 2012), service-oriented companies (Kianto *et al.*, 2010), electronics (Wang, 2008).

On the other hand, there have been studies that could not establish a direct relationship between IC and stock market value (Stahle *et al.*, 2011) or financial performance of companies in South Africa (Firer and Williams, 2003) and Greece (Maditinos *et al.*, 2011). Other authors (Ramirez and Hachiya, 2012) have encountered mixed results across and within industries in Japan and suggested that, even though intangibles may carry value, this is not necessary reflected in all companies and in all sectors. In addition, the researchers have stressed the scarcity of disclosed information about a firm's intangible assets, therefore investors may not be able to perceive their value. Similar observations have been made by Lev (2004) and Nimtrakoon (2015), in respect of the companies' financial statements.

Another issue that has been discussed in the literature (Andreeva and Garanina, 2016) is the difference between developed and emergent economies, as well as the lack of sufficient research in the latter ones, when it comes to the influence of IC components on company growth. In this context, it should be noted that few studies in Romania address the issue of intangibles' influence on company performance and market value. Morariu (2014) has investigated with negative results the relationship in listed companies, by employing the VAIC^{TM} model. One possible explanation put forward had to do with a lack of market maturity and the impact of the global economic crisis in 2008. Nevertheless, other findings from the study showed that market value was influenced by company size, and that both companies from traditional industries and from knowledge intensive industries were in principle more effective in creating value from their IC than from physical and financial capital. A more recent research (Vasiu and Ilie, 2018) set out to analyse the sustainable growth rate of Romanian listed companies, but the analysis concerned a sample of only five companies in the energy sector and employed a different model than the one proposed in the present study. The findings confirmed a constant, sustainable growth, mostly influenced by the retention rate.

Although there has been an increase in interest in studies analyzing the impact of IC on the performance of companies, the literature review shows that there is a lack of such studies in specific emerging markets. Moreover, it has been found that existing studies pay little attention to differences between countries, and many authors focus on investigating the relationship between IC and firm performance in the context of developed countries, which can be explained by the fact that most authors come from developed countries such as the USA, Japan, and Germany. Also, it has been stated that generalizing the use of the same approach for developed and emerging countries cannot guarantee representative results, as there are different characteristics of the innovation activity in which firms engage (Boiko, 2021).

Scholars point out that the pattern of R&D activity in emerging markets deviates significantly from those of developed economies (Lee and Choi 2015; Zhu and Huang, 2012). In this regard, Lee and Choi (2015) found a positive effect of R&D intensity with regard to Tobin's Q in the pharmaceutical industry and Zhu and Huang (2012) found that financial performance of Chinese listed IT firms increases with the intensity of investments in R&D. By contrast, empirical evidence from the sample of Taiwanese manufacturing firms shows a negative relationship between R&D and profitability (Yang *et al.*, 2010). Insights into the relationship between R&D and firm performance are limited, and the results remain contradictory. The conflicting views on the link between R&D and performance highlight how complex the nature of this relationship is.

In order to fill a research gap concerning the situation of IC assessment in emergent economies and more specifically in Romania, this paper looks into the investments in intangibles by companies listed on Bucharest Stock Exchange, as reflected in their financial reports. The sample comprises a larger selection of enterprises in industries such as manufacturing, pharmaceuticals, heavy industries, oil, gas, electricity, tourism. As previously indicated, given the scarcity of research on Romanian companies' IC development and how investment in intangible assets is valued on the stock market, this study focuses on the relation between sources of growth in the current economic frame and companies' sustainable growth, as well as the effect of intangible assets on firm value in Romania. To this end, the current work puts forward a computation model which includes financial indicators associated with the stock market, detailed in Section 3.

2.1 Research hypotheses

As results from the literature review, most studies demonstrate positive relations between the intangible assets and the market value of a company, the financial performance and/or the company growth (Ocak and Fındık, 2019; Xu and Wang, 2018; Rahko, 2014; Nimtrakoon, 2015; Sardo and Serrasqueiro 2017, 2018; Amin and Aslam, 2017), while some works have presented contradictory results (Morariu, 2014; Firer and Williams, 2003; Maditinos, 2011; Stahle *et al.*, 2011; Ramirez and Hachiya, 2012). Albertini and Berger-Remy (2019) have stressed that financial performance allows investments in intangibles. Fonseka *et al.* (2014) have stressed that the ability to raise capital from shareholders and to gain easy access to financing offers companies a competitive advantage. Corrado *et al.* (2005, 2009) have emphasized that the intangibles that support growth are the computerized information, the innovative property and the economic competences. Testing the cumulative value of intangible assets as classified by the previously cited authors, Ocak and Fındık (2019) demonstrated a positive relationship with the sustainable growth rate and the firm value.

Therefore, there is an expectation that a similar positive relationship as emphasized by the literature should apply for listed Romanian companies, that is why the following hypotheses are being proposed:

H1a. Companies with greater investments in Patents tend to have better sustainable growth rate;

H1b. Companies with greater investments in R&D tend to have better sustainable growth rate;

H1c. Companies with greater investments in IT Programs tend to have better sustainable growth rate;

We expect that the cumulative value of the sub-components of intangible assets will have a positive and significant effect on the sustainable growth of firms if the above hypotheses are supported.

H2a. Companies with greater investments in Patents tend to have better firm value

H2b. Companies with greater investments in R&D tend to have better firm value;

H2c. Companies with greater investments in IT Programs tend to have better firm value;

We expect that the cumulative value of the sub-components of intangible assets to have a positive and significant effect on firm value if the above hypotheses are supported.

3. Method, models and data collection

3.1 Sample selection and data collection

In this study the authors used data consisting of 126 observations from 42 out of 78 companies listed on the Bucharest Stock Exchange, representing sectors like manufacturing,

pharmaceuticals, gas, oil, electricity, heavy industries, tourism. It is mandatory that these companies publish their financial results twice a year, and their financial documents can be easily accessed by user accounts on Bucharest Stock Exchange (BSE). Listed companies are to include in their annual financial statements sections dedicated to intangible assets. Specific information regarding the sub-components of intangible assets is located and has been collected from the footnotes of the financial statements. Data on demographics was not available for the companies included in the study. The data refers to various types of intangible assets firms invest in, and they have been classified for the purpose of this study in the three categories defined by Corrado *et al.* (2005) and detailed in the sub-section on Independent Variables below (R&D, patents, IT programs, brand, shares in subsidiaries, loans to groups, shares in other entities).

Companies that did not disclose enough information regarding intangibles, or did not have intangibles registered, have not been included in the study. Due to data access problems and difficulties with the hand-collection process, the dataset starts in 2017 and ends in 2019. The main difficulties identified during data collection were the following:

(1) On the official website of the Bucharest Stock Exchange, the annual financial data of the listed companies are public only for the last 3 years, in a consolidated format (e.g. total value of intangible assets, total value of tangible assets).

(2) In order to obtain additional information about the intangible assets (Research and Development, patent, IT Programs, economic competence, etc.) that the listed companies hold, it was necessary to centralize the information from the documents submitted by these companies to the Ministry of Finance. This information is in a different format from those published by the Bucharest Stock Exchange and is available only in PDF format.

(3) It was then necessary to compare the data from these sources with that published by the Bucharest Stock Exchange to ensure that the information is valid and reliable.

The value at which a share was traded by a listed company has been public only for the last 3 years. This information is important because it contributes to the calculation of the market value of the listed company.

Sustainable Growth Rate and Firm Value are calculated based on data obtained from the annual financial information submitted by the companies to the Ministry of Finance and compared with information published by the Bucharest Stock Exchange.

There are no banks included in the study, as they did not meet the criteria for data collection. Also, companies from the ICT sector are not listed on the regulated market, but on AERO, which is a secondary market of the Bucharest Stock Exchange. The companies analyzed in this study come from the following industries (see Table 1):

3.2 Computation models

The calculation models for SGR and FV offer an objective method to assess the impact of intangibles on the company performance and value, as they rely on public, auditable data, retrieved from the companies' financial reports (Xu and Wang, 2018). Such models allow for comparison with other findings at national and international level.

In this study, to test the hypotheses, it has been employed the ordinary least squares (OLS) model through a linear regression. As emphasized by Tran and Vo (2020) estimation methods like the ordinary least squares (OLS) have been employed extensively in empirical studies, as there is expected that estimation coefficients are many times uncertain.

For the study, the estimation model is as follows:

No	Industry	Number of observations	Sector representation
1	Heating installations	3	2.38%
2	Aeronautical industry	9	7.14%
3	Car parts production	3	2.38%
4	Aluminum production	3	2.38%
5	Pharma	15	11.90%
6	Technical rubber goods	3	2.38%
7	Beer manufacturer	3	2.38%
8	Stock exchange administration	3	2.38%
9	Brick production	3	2.38%
10	Cogeneration plants production	3	2.38%
11	Automotive	6	4.76%
12	Energy	15	11.90%
13	Real estate	3	2.38%
14	Health	3	2.38%
15	Oil and gas	18	14.29%
16	Prefabricated concrete products	3	2.38%
17	Packaging manufacturing	6	4.76%
18	Shipbuilding	3	2.38%
19	Tourism	9	7.14%
20	Chemical industry	3	2.38%
21	Pipes manufacturer	3	2.38%
22	PVC	3	2.38%
23	Metal processing	3	2.38%

Table 1. Industry representation

(1) $SGR\ i,t\ or\ SGR2\ i,t.\ or\ FV\ i,t = \beta 1\ R\&D\ i,t + \beta 2\ Parent\ i,t + \beta 3\ IT\_Programs\ i,t + \beta 4\ Brand\ i,t + \beta 5\ Shares\_in\_subsidiaries\ i,t + \beta 6\ Loans\_to\_grups\ \ i,t + \beta 7\ Shares\_in\_other\_entities\ i,t + \beta 8\ Financial\_securities\ i,t + \beta 9\ Other\_loans\ i,t + \beta 10\ Employee\_number\ i,t + \beta 11\ Firm\_performance\ i,t + \beta 12\ Firm\_size\ i,t + \beta 13\ Leverage\ i,t$

The above model is utilized to estimate the effect of each sub-component of intangible assets on sustainable growth rate (*SGR1* and *SGR2*) and the firm value (*FV*) of companies. In addition, this will test which sub-component of intangible assets is more important in improving sustainable growth and firm value. The coefficients from $\beta 1$ to $\beta 10$ in the model are expected to be positive. In this study, sustainable growth rate (*SGR1* and *SGR2*) and firm value (*FV*) are dependent variables while the sub-components of intangible assets and firm structure-specific variables are independent.

3.3 Dependent variables (DV)

3.3.1 Sustainable growth rate (SGR). The sustainable growth rate (SGR) indicates a company's optimal growth from a financial point of view, based on own resources and without employing external finance (Higgins, 1977). This first formula (SGR1) reflects a firm's retention policy, cost containment ability, asset utilization efficiency, and financial strategy. A second formula (SGR2) proposed by Van Horne (1987) reflects the maximum growth rate that can be achieved without debt or equity external financing. Both models have been proved consistent (Fonseka, 2012). Formulas derived from the models established by Higgins (1977) and Van Horne (1987) have been used by various researchers recently to calculate SGR (Huang and Liu, 2009; Xu and Wang, 2018; Ocak and Fındık, 2019).

(1) SGR1 = Profit Margin × Asset Turnover × Retention Ratio × Financial Leverage (Higgins);

- Profit Margin = Net Income/Sales

- Asset Turnover = Sales/Total Assets
- Financial Leverage = Total Debts/Total Assets
- Retention Rate = Retained earnings/Net income

(2) SGR2 = ROE × Retention Ratio/1−ROE × Retention Ratio (Van Horne)

- ROE = Net income/Shareholders' equity.

3.3.2 Firm value. The firm value (FV) is computed as market value of assets divided by book value of assets (Chen *et al.*, 2005; Ocak and Fındık, 2019):

(3) FV = Market value of assets/Book value of assets

Book value of assets refers to the value of a firm according to the balance sheet of firm (i.e. total equity of firm), while market value of assets is calculated as the total number of shares of firms multiplied by the price of a share. The data regarding the number of shares and price per share, were retrieved from Bucharest Stock Exchange database.

3.4 Independent variables (IV)

The independent variables of the study comprise sub-components of intangible assets and firm structure-specific variables. All these variables are registered in the balance sheet at the end of the fiscal year.

3.4.1 Sub components of intangible assets are the following:.

(1) Research and Development (*R&D*) – calculated as the total value of R&D expenses (*Innovative Property*);

(2) Patent (*Patent*) – calculated as the total value of expenses with patents and trademarks (*Innovative Property*);

(3) Information and Technology programs (*IT Programs*) – calculated as the total value of expenses with IT programs, license and databases (*Computerized Info*);

(4) Brand–calculated as the total value of the good will (*Economic Competence*);

(5) Shares held in subsidiaries (Shares in subsidiaries) – calculated as the total value of investments in other subsidiaries through shares (*Economic Competence*);

(6) Loans to group entities – calculated as the total value of loans to group entities (*Economic Competence*);

(7) Shares held in associates and jointly controlled entities – calculated as the total value of investments in controlled entities through shares (*Economic Competence*);

(8) Financial securities (Financial Securities) – calculated as the total value of investments in financial securities (*Economic Competence*);

(9) Other loans (Other Loans) – calculated as the total value of loans (*Economic Competence*);

3.4.2 Firm structure-specific variables. These variables are included in this study because recent researches documented that large firms, firms with low leveraging, profitable firms have more opportunities for sustainable growth and these structural features of firms can be decisive for investing in intangible assets. These specific variables are presented further:

(1) Firm size (*Firm Size*) is the natural logarithm of total assets of a firm;

(2) Financial leverage (*Leverage*) is calculated as the total debts divided by total assets.

(3) Financial performance (*Firm Performance*) is measured as net income divided by total assets.

(4) Employees numbers (*Employees no.*) refers to the total number of employees of each company by the end of the fiscal year.

(5) Industry (*Industry*) refers to the type of industry in which the company operates. The centralized and analysed data come from companies operating in 23 different industries.

4. Results and discussion

This chapter provides the results of the study. The first part analyses some descriptive statistics regarding the variables used and then a dimension reduction analysis is presented. After that, the internal reliability of the scales is shown with the use of Cronbach's alpha. The next section discusses the correlations between the variables. In the last part, a linear regression was performed to test the hypotheses.

Also, discussions related to the main important firm structure-specific variables are presented in this chapter. The main variables discussed are represented by industry and firm performance, which according to our results have a significant impact over SGR 1, SGR 2 and FV.

4.1 Results

4.1.1 Descriptive data. Table 2 displays the basic features of the data in the study by providing simple summaries about the sample and the measurements. It also serves to present quantitative descriptions in a manageable form and to simplify the outlook of large amounts of data.

The mean value of SGR1 is 0.008. The range of values of SGR1 varied from −0.222 to 0.079. The mean value of SGR2 is 0.067, and the range values of SGR2 varied from −1.37 to

Table 2. Data descriptive

Descriptive statistics	Mean	Std. Deviation	Minimum	Maximum	Missing	Valid
SGR1	0.008	0.027	−0.222	0.079	0	126
SGR2	0.067	0.176	−1.37	0.684	0	126
Firm_Value	0.979	0.891	−0.759	6.388	0	126
Employees_no	1246.389	2121.104	42	13322	0	126
Firm_Performance	0.254	1.576	−0.383	17.702	0	126
Leverage	0.29	0.203	0.003	1.057	0	126
RD	4.372e +6	2.315e +7	0	1.537e +8	0	126
Patent	8.751e +6	4.089e +7	0	3.211e +8	0	126
IT_Programs	5.669e +7	3.515e +8	0	2.561e +9	0	126
Brand	568664.381	2.305e +6	0	1.165e +7	0	126
Shares_in_subsid	1.173e +8	3.896e +8	0	2.184e +9	0	126
Loans_to_grups	9.015e +6	8.635e +7	0	9.681e +8	0	126
Shares_in_oth_entit	4.665e +6	1.905e +7	0	1.335e +8	0	126
Financial_securities	3.251e +6	1.323e +7	0	8.341e +7	0	126
Other_loans	6.089e +7	3.330e +8	0	2.283e +9	0	126
Firm_size	9.630e +8	2.010e +9	4.392e +6	9.750e +9	0	126
Intangibles	2.655e +8	7.153e +8	0	3.469e +9	0	126
Industry	11.643	6.142	1	23	0	126

0.684. The average value of firm value (FV) is 0.979, and the range of values of FV varied from −0.759 to 6.388.

In the next stage a preliminary Exploratory Factor Analysis (EFA) was performed in order to underscore the factors resulting from the model under analysis and then to provide a precise measure of the tested dimension. At the same time, a Principal Component Analysis (PCA) was conducted with the view to translate into findings new variables that are linear functions of those in the original dataset, that successively maximize variance and that are uncorrelated with each other (Jolliffe and Cadima, 2016). The p value from the Chi-squared test in both cases was lower than 0.001 which means it is a good fit for both EFA and PCA, taking into consideration the fact that 0.05 is the maximum acceptable value for a good fit. Also, a reliability analysis has been run to validate the model and to establish the composition of each factor. The Cronbach's Alpha for the factors combined is 0.687, which is deemed acceptable in exploratory research even though values between 0.70 and 0.90 can be regarded as satisfactory (Nunally and Bernstein, 1994). In conclusion the proposed model can be considered as being reliable.

4.1.2 Correlations analysis. Correlation analysis is a statistical method used to evaluate the strength of the relationship between two quantitative variables. A high correlation means that two or more variables have a strong relationship with each other, while a weak correlation means that the variables are hardly related. The data displayed in Table 2 below were obtained after the correlation analysis was run. For the analysis, Pearson and Spearmen Correlation Coefficients have been used (see Table 3).

From the above table, where the correlation between each dependent variable and each independent variables of the proposed model are presented, the following aspects can be concluded:

4.1.2.1 Sustainable growth rate 1. According to Pearson Coefficient, IT Programs (−0.027), R&D (−0.016) and Patents (−0.025) have a negative effect over SGR1, but not significant. However, Spearman Coefficient, shows that R&D (0.017) and IT Programs (0.159) have a positive effect over SGR1, while Patents (−0.109) has a negative effect, but not significant.

Even though the results are contradictory in case of IT Programs and R&D, because they have a different impact over SGR 1, once a positive impact (Spearman Coefficient) and once a negative impact (Pearson Coefficient), partially the hypothesises are not supported, because in this case both sub components do not have a significant impact over SGR1. The same conclusion can be supported when it comes to Patents.

However, from the results of the correlation matrix, other interesting aspects can be observed. Three variables categorised as firm structure specific variable and one variable categorised as economic competence have a significant effect over SGR1 even though these aspects were not taken into consideration in the first phase. According to the Pearson Correlation Coefficient there is a negative and significant correlation between SGR 1 and Leverage (−0.276) while according to Spearman Coefficient there is a negative and significant correlation between SGR 1 and Loans to groups (−0.25). In addition, according to Spearman Correlation Coefficient there is a positive and significant correlation between SGR 1 and Firm Performance (0.504). In case of industry there is a negative and significant correlation with SGR 1, which is demonstrated by both coefficients (−0.344, −0.363). Furthermore, it is important to observe the positive and significant correlation between SGR 1 and Firm Value (0.199; 0.404), according to both correlation coefficients.

4.1.2.2 Sustainable growth rate 2. According to Pearson Coefficient, there is a negative and insignificant correlation between SGR2 and IT Programs (−0.026), R&D (−0.011) and Patents (−0.015), while Spearman coefficient shows a negative and insignificant correlation between SGR 2 and R&D (−0.02), Patents (−0.034) and a positive and insignificant correlation between SGR 2 and IT Programs (0.137)

		Pearson		Spearman	
		r	*p*	Rho	*p*
SGR1	SGR2	0.962***	<0.001	0.926***	<0.001
SGR1	Firm_Value	0.199*	0.025	0.404***	<0.001
SGR1	Employees_no	−0.023	0.8	−0.031	0.729
SGR1	Firm_Performance	0.026	0.775	0.504***	<0.001
SGR1	Firm_size	−0.063	0.48	0.019	0.833
SGR1	Leverage	−0.276**	0.002	0.104	0.248
SGR1	RD	−0.016	0.855	0.017	0.854
SGR1	Patent	−0.025	0.785	−0.109	0.225
SGR1	IT_Programs	−0.027	0.766	0.159	0.075
SGR1	Brand	0.019	0.833	0.018	0.841
SGR1	Shares_in_subsid	−0.09	0.317	−0.061	0.499
SGR1	Loans_to_grups	−0.027	0.76	−0.25**	0.005
SGR1	Shares_in_oth_entit	−0.062	0.489	0.049	0.59
SGR1	Financial_securities	0.042	0.643	−0.081	0.368
SGR1	Other_loans	−0.02	0.822	−0.042	0.639
SGR1	Industry	−0.344***	<0.001	−0.363***	<0.001
SGR2	Firm_Value	0.25**	0.005	0.465***	<0.001
SGR2	Employees_no	0.008	0.931	−0.101	0.258
SGR2	Firm_Performance	0.049	0.586	0.698***	<0.001
SGR2	Firm_size	−0.045	0.619	0.045	0.621
SGR2	Leverage	−0.361***	<0.001	−0.172	0.054
SGR2	RD	−0.011	0.9	−0.02	0.82
SGR2	Patent	−0.015	0.868	−0.034	0.704
SGR2	IT_Programs	−0.026	0.773	0.137	0.126
SGR2	Brand	−0.033	0.714	−0.006	0.949
SGR2	Shares_in_subsid	−0.075	0.404	−0.015	0.871
SGR2	Loans_to_grups	−0.013	0.881	−0.205*	0.021
SGR2	Shares_in_oth_entit	−0.074	0.408	0.05	0.577
SGR2	Financial_securities	0.087	0.335	−0.102	0.256
SGR2	Other_loans	−0.007	0.94	0.102	0.256
SGR2	Industry	−0.387***	<0.001	−0.363***	<0.001
Firm_Value	Employees_no	−0.009	0.92	−0.003	0.973
Firm_Value	Firm_Performance	0.002	0.979	0.372***	<0.001
Firm_Value	Firm_size	−0.108	0.23	0.149	0.095
Firm_Value	Leverage	0.18*	0.044	0.082	0.359
Firm_Value	RD	−0.1	0.263	−0.212*	0.017
Firm_Value	Patent	−0.093	0.301	−0.026	0.777
Firm_Value	IT_Programs	−0.015	0.87	0.279**	0.002
Firm_Value	Brand	0.103	0.251	0.269**	0.002
Firm_Value	Shares_in_subsid	−0.006	0.95	0.054	0.545
Firm_Value	Loans_to_grups	−0.006	0.947	−0.063	0.486
Firm_Value	Shares_in_oth_entit	0.621***	<0.001	0.396***	<0.001
Firm_Value	Financial_securities	0.04	0.658	−0.03	0.743
Firm_Value	Other_loans	−0.079	0.382	0.027	0.763
Firm_Value	Industry	−0.264**	0.003	−0.449***	<0.001

Table 3.
Correlation matrix

Note(s): *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

It was found that innovative property (R&D and Patents) had no effect on sustainable growth rates (SGR1 and SGR2), thus, we do not accept H1a and H1b.

In addition, the results show that IT Programs had no effect on sustainable growth rates (SGR1 and SGR2). In this case H1c is not accepted.

However, the results of the correlation matrix show other interesting aspects that are worth to be mentioned.

(1) According to Pearson and Spearmen Correlation Coefficients there is a positive and significant correlation between SGR2 and Firm Value (0.25; 0.465);

(2) According to Spearmen Correlation Coefficients there is a positive and significant correlation between SGR2 and Firm Performance (0.698);

(3) According to Pearson Correlation Coefficients there is a negative and significant correlation between SGR2 and Leverage (−0.361);

(4) According to Spearmen Correlation Coefficients there is a negative and significant correlation between SGR2 and Loans to groups (−0.205);

(5) According to Spearmen Correlation Coefficients there is a negative and significant correlation between SGR2 and Industry (−0.344, −0.363);

Surprisingly, the findings obtained by the correlation matrix show completely different results than those assumed at the beginning of this study. It seems that the variables categorized as economic competence play an important role in the sustainable growth rate for the companies listed on the Regulated Market from the Bucharest Stock Exchange.

4.1.2.3 Firm value. Based on Pearson Coefficient there is a negative and insignificant correlation between FV and R&D (−0.1) and Patents (−0.093), while Spearman coefficient shows a negative and significant correlation between FV and R&D (−0.212) and a negative and insignificant correlation between FV and Patents (−0.026).

When it comes to IT Programs and FV, Pearson Coefficient shows a negative and insignificant correlation (−0.015), while Spearmen Coefficient shows a positive and significant correlation (0.279)

The results indicate that Patents had no effect on Firm Value, thus H2a is not accepted. Moreover, R&D have a negative effect on Firm Value, even though according to the hypothesises it was expected to have a positive and significant impact on firm value. Thus, H2b is not accepted. However, IT Programs have a positive and significant effect over FV, so H2c is accepted.

Other important results from the correlation matrix that are worth being mentioned, because they may have an important aspect in the next phase (regression analysis), are the following:

(1) According to Spearmen Correlation Coefficient there is a positive and significant correlation between Firm Value and Brands (0.269);

(2) According to Pearson Correlation Coefficient there is a positive and significant correlation between Firm Value and Leverage (0.18);

(3) According to Spearmen Correlation Coefficient there is a positive and significant correlation between Firm Value and Firm Performance (0.372);

(4) According to Person and Spearmen Correlation Coefficient there is a positive and significant correlation between Firm Value and Shares held in associates and jointly controlled entities (0.621; 0.396).

(5) According to Pearson Correlation Coefficients there is a negative and significant correlation between Firm Value and Industry (−0.449);

Firm structure-specific variables can influence significantly sustainable growth rate and firm value for the companies listed on the Regulated Market from the Bucharest Stock Exchange.

The main important *firm structure-specific variables are:*

(1) Firm_Performance – has a significant impact over SGR 1, SGR 2 and FV;

(2) Industry – has a significant impact over SGR 1, SGR 2 and FV;

4.1.3 Regression analysis. Regression analysis is a set of statistical operations conducted to reveal the relationships between a dependent variable and one or more independent variables, and to infer causal relationships. It is also used for determining the parameters of a model posited to describe the data set.

Taking into consideration that in the study three dependent variables are used, the authors have run three parallel regressions. The results are presented in the next sections.

4.1.3.1 Sustainable growth rate 1. The *R*, correlation coefficient between the variables is 0.551, which indicate a moderate uphill (positive) relationship (*R* is smaller than 0.7). The R^2, the amount of variance in the DV that is explained by the IVs, in our case is 0.303 which is good because in this case, the sub-components of intangibles explain 0.229 of variance in Sustainable growth rate 1 (see Tables 4 and 5).

As it can be seen in the table, the proposed model is good, because the subcomponents of the intangibles are good predictors for the outcome variable. The significance (*p*-value) is lower than 0.001, so in short, the linear model does predict significantly the Sustainable Growth Rate 1 (see Table 6).

4.1.3.2 Sustainable growth rate 2. The *R*, correlation coefficient between the variables is 0.640, which indicate a moderate uphill (positive) relationship (*R* is smaller than 0.7). The R^2, the amount of variance in the DV that is explained by the IVs, in our case is 0.410 which is good because in this case, the sub-components of intangibles explain 0.347 of variance in Sustainable Growth Rate 2 (see Tables 7 and 8).

As it can be seen in the table, the proposed model is good, because the subcomponents of the intangibles are good predictors for the outcome variable. The significance (*p*-value) is lower than 0.001, so in short, the linear model does predict significantly the Sustainable Growth rate 2 (Table 9).

4.1.3.3 Firm value. The *R*, correlation coefficient between the variables is 0.731, which indicate a strong (positive) relationship (*R* is above 0.7). The R^2, the amount of variance in the DV that is explained by the IVs, in our case is 0.474 which is good because in this case, the sub-components of intangibles explain 0.484 of variance in Firm Value (see Tables 10 and 11).

As it can be seen in the table, the proposed model is good, because the sub components of the intangibles are good predictors for the outcome variable. The significance (*p*-value) is lower than 0.001, so in short, the linear model does predict significantly the Firm Value (see Tables 12 and 13).

Following the findings of the statistical analysis described in this section, the only hypothesis that has been confirmed is H 2.3, while all others have been rejected.

Table 4.
Model summary SGR 1

Model summary Model	*R*	R^2	Adjusted R^2	RMSE
1	0.551	0.303	0.229	0.024

Table 5.
ANOVA results

ANOVA Model		Sum of squares	df	Mean square	*F*	*p*
1	Regression	0.027	12	0.002	4.099	<0.001
	Residual	0.066	113	5.925e −4		
	Total	0.090	125			

Table 6. Collinearity statistics for SGR 1

Collinearity statistics	Unstandardized	Standard error	Standardized	t	P	Tolerance	VIF
(Intercept)	0.014	0.006		2.47	0.015		
RD	4.408e −10	3.514e −10	0.38	1.254	0.212	0.067	14.906
Patent	−1.253e −10	1.767e −10	−0.191	−0.709	0.48	0.085	11.753
IT_Programs	−6.916e −12	7.260e −12	−0.091	−0.953	0.343	0.682	1.465
Brand	−1.630e −10	9.633e −10	−0.014	−0.169	0.866	0.903	1.107
Employees_no	−8.921e−7	2.988e−6	−0.071	−0.299	0.766	0.111	9.048
Shares_in_subsid	−1.411e −11	9.023e −12	−0.205	−1.564	0.121	0.359	2.783
Loans_to_grups	−1.207e−9	2.326e −10	−3.885	−5.191	<0.001	0.011	90.855
Shares_in_oth_entit	1.111e −10	1.188e −10	0.079	0.936	0.351	0.867	1.153
Firm_Performanfe	0.067	0.013	3.964	5.255	<0.001	0.011	92.29
Loans_to_oth_entit	−2.871e−9	3.954e−9	−0.075	−0.726	0.469	0.581	1.72
Firm_size	1.283e −12	3.119e −12	0.096	0.411	0.682	0.113	8.85
Industry	−0.001	3.768e−4	−0.238	−2.761	0.007	0.829	1.207

4.2 Discussions

According to the results described above, *firm structure-specific variables can influence significantly* sustainable growth rate and firm value for the companies listed on the Regulated Market from the Bucharest Stock Exchange (see Table 14).

The main important firm structure-specific variables are:

(1) Firm_Performance – has a significant impact over SGR 1, SGR 2 and FV;

(2) Industry – has a significant impact over SGR 1, SGR 2 and FV;

4.2.1 Industry variable. According to the literature, it was found that the effect of intangibles on the performance of companies differs from sector to sector and the main explanation is given by the fact that there are differences between them, based on innovation activity (Coad and Rao, 2008). Given the existing economic uncertainties in the market as well as the high level of unpredictability of results, for many companies the activity of intangibles, in this case R&D activity, in the production sector, is associated with the decrease of sales.

From the table above it can be seen that the companies listed on the Bucharest Stock Exchange reported that they have intangible assets, the only exception being the prefabricated cement sector. At the same time, regardless of the industry in which the companies operate, they hold IT licenses and computer programs, as companies in all industrial sectors rely nowadays on computerized information to conduct their business and to create value.

Thus, from the value of the intangible assets reported by the companies listed on the Bucharest stock exchange, 41.02% come from holding IT licenses and computer programs, 6.33% come from Patents and 3.16% come from R&D. It is important to mention that 96.52% of the value of IT licenses and software is owned by companies operating in the Oil and Gas industry, approximately 1.72% of the value is owned by companies operating in the Pharma field and the difference of 1.76% is owned by companies which operates in the remaining 21 industries.

A similar situation is found in the case of R&D value where 84.44% of the value is held by companies operating in the Oil and Gas industry, 8.97% of the value is held by companies operating in the Energy industry and 5.38% comes from companies operating in Pharma industry. The remaining difference of 1.21% comes from companies operating in the remaining 20 industries.

Regarding the value of patents, approximately 81.17% is owned by companies operating in the Oil and Gas industry, 13.34% of the value is owned by companies operating in the Energy industry and 2.52% comes from companies operating in the Pharma industry.

Table 7.
Model summary SGR2

Model summary Model	R	R^2	Adjusted R^2	RMSE
1	0.640	0.410	0.347	0.142

Table 8.
ANOVA results SGR2

ANOVA Model		Sum of squares	df	Mean square	F	p
1	Regression	1.583	12	0.132	6.547	<0.001
	Residual	2.277	113	0.02		
	Total	3.86	125			

Table 9. Collinearity statistics for SGR 2

Collinearity statistics	Unstandardized	Standard error	Standardized	t	p	Tolerance	VIF
(Intercept)	0.113	0.035		3.213	0.002		
RD	2.077e −9	2.117e −9	0.274	0.981	0.329	0.067	14.906
Patent	−6.218e −10	1.065e−9	−0.145	−0.584	0.56	0.085	11.753
IT_Programs	−6.897e −11	4.375e −11	−0.138	−1.576	0.118	0.682	1.465
Brand	−5.173e −9	5.805e −9	−0.068	−0.891	0.375	0.903	1.107
Employees_no	6.017e −6	1.801e −5	0.073	0.334	0.739	0.111	9.048
Shares_in_subsid	−9.150e −11	5.437e −11	−0.203	−1.683	0.095	0.359	2.783
Loans_to_grups	−9.116e −9	1.402e −9	−4.478	−6.503	<0.001	0.011	90.855
Shares_in_oth_entit	7.542e −10	7.156e −10	0.082	1.054	0.294	0.867	1.153
Firm_Performanfe	0.511	0.077	4.581	6.6	<0.001	0.011	92.29
Loans_to_oth_entit	−2.527e −8	2.383e −8	−0.1	−1.06	0.291	0.581	1.72
Firm_size	5.365e −12	1.879e −11	0.061	0.285	0.776	0.113	8.85
Industry	−0.008	0.002	−0.277	−3.491	<0.001	0.829	1.207

The remaining difference of 2.96% comes from companies operating in the remaining 20 industries.

For the companies listed on the Bucharest Stock Exchange, most of the intangible assets are found in the component of IT licenses and computer programs (41.02%), the component of patents represents 6.33% and the R&D component represents 3.16%. It is important to mention that the value of economic competencies (brand, shares held in subsidiaries, loans to group entities, financial securities, etc.) represents approximately 48.94% of the value of intangible assets of companies listed on the Bucharest Stock Exchange.

Therefore, sector-specific studies require attention because the decision to invest in intangibles activity differs from one industry to another, a situation similar with the one of the companies listed on the Bucharest Stock Exchange, where approximately 99% of the value of intangible assets is held by companies which operate in the Oil and Gas industry (96.33%), followed by the Pharma industry (1.43%) and then by the Energy industry (1.36%). It should also be borne in mind that operating in one of the three industries mentioned above requires very large investments in tangible assets such as wells, extraction machines, production machines and other tools that require automation, and their implementation requires investments in intangible assets such as IT licenses and software, R&D or patents.

Thus, for the companies listed on the Regulated Market of the Bucharest Stock Exchange it can be said that intangibles investments can add a higher value for the companies that activate in the production sector than in the case of companies operating in the services sector (Ehie and Olibe, 2010). At the same time, Yang *et al.* (2010) mention that we must distinguish between over-technological companies and less technological companies because the technological opportunities are less in the case of the latter. In this case, the companies from Oil and Gas industry can be considered over-technological companies while the companies from Prefabricated concrete products can be considered less technological companies.

4.2.2 Financial performance variable. Based on the data presented in the table "Link between financial performance – financial value – intangible assets", in the case of companies listed on the Bucharest Stock Exchange, it can be observed a direct link between financial performance (net income/total assets) - firm value (market value of assets/book value of assets) – intangible assets value.

Thus, very good results both in terms of financial performance and firm value, are found in industries where investments in intangible assets have been considerable. Therefore, for the Oil and Gas industry, which holds 96.33% of the value of intangible assets related to companies listed on the Bucharest Stock Exchange, financial performance is 114.25% and

Table 10.
Model summary

Model summary Model	R	R^2	Adjusted R^2	RMSE
1	0.731	0.434	0.484	0.640

Table 11.
ANOVA results

ANOVA Model		Sum of squares	df	Mean square	F	p
1	Regression	47.059	12	4.418	10.784	<0.001
	Residual	52.249	113	0.41		
	Total	99.309	125			

Collinearity statistics	Unstandardized	Standard error	Standardized	t	p	Tolerance	VIF
(Intercept)	1.164	0.158		7.346	<0.001		
RD	−7.968e −9	9.547e −9	−0.207	−0.835	0.406	0.067	14.906
Patent	1.891e −9	4.800e −9	0.087	0.394	0.694	0.085	11.753
IT_Programs	−3.233e −10	1.973e −10	−0.127	−1.639	0.104	0.682	1.465
Brand	3.345e −10	2.617e −8	8.637e −4	0.013	0.99	0.903	1.107
Employees_no	1.505e−4	8.119e−5	0.358	1.854	0.066	0.111	9.048
Shares_in_subsid	3.403e −10	2.452e −10	0.149	1.388	0.168	0.359	2.783
Loans_to_grups	−1.294e−8	6.320e−9	−1.254	−2.048	0.043	0.011	90.855
Shares_in_oth_entit	3.105e−8	3.227e−9	0.664	9.623	<0.001	0.867	1.153
Firm_Performanfe	0.7	0.349	1.238	2.006	0.047	0.011	92.29
Loans_to_oth_entit	1.424e−8	1.074e−7	0.011	0.133	0.895	0.581	1.72
Firm_size	−1.149e −10	8.473e −11	−0.259	−1.356	0.178	0.113	8.85
Industry	−0.041	0.01	−0.28	−3.966	<0.001	0.829	1.207

Table 12. Collinearity statistics for Firm Value regression

firm value has an index of 13.99, which means that the market value of companies operating in this industry is about 14 times higher than their book value. Notable results are also found in companies operating in the Pharma industry, which holds 1.43% of the value of intangible

Table 13. Model summary for SGR1, SGR2 and FV

Model summary Model	R	R^2	Adjusted R^2	RMSE
SGR1	0.551	0.303	0.229	0.024
SGR2	0.640	0.410	0.347	0.142
FV	0.731	0.534	0.484	0.640

Table 14. Link between financial performance – financial value – intangible assets

Industry	Firm performance	Firm value	Intangible resources	R&D	Patents	It programs
Aeronautical industry	123.39%	12.34	19,499,616	–	2,653,199	16,846,417
Aluminium production	13.22%	5.08	23,242,948	–	19,414,718	3,828,230
Automotive	27.48%	3.22	14,534,608	4,675,799	9,588,750	194,824
Beer manufacturer	17.68%	3.07	166,918	–	–	166,918
Brick production	30.25%	2.66	7,506,553	1,709,871	404,354	5,392,328
Car parts production	−1.99%	1.33	220,484	–	107,122	113,362
Chemical industry	−24.15%	1.42	1,003,503		198,996	804,507
Cogeneration plants production	5.37%	1.53	2,092,320		–	2,092,320
Energy	75.70%	10.48	237,528,984	49,414,484	147,143,952	40,915,190
Health	−1.98%	15.39	22,569,216			–
Heating installations	36.38%	4.47	296,305	296,305	–	–
Metal processing	−18.84%	(0.07)	1,829,702		–	1,829,702
Oil and gas	114.25%	13.19	16,774,601,404	465,100,827	895,038,899	6,894,271,540
Packaging manufacturing	21.54%	3.43	5,232,056		245,252	1,548,912
Pharma	122.62%	20.94	249,554,180	29,613,389	27,749,326	122,904,062
Pipes manufacturer	6.11%	2.87	4,968,980		–	4,968,980
Prefabricated concrete products	17.35%	1.55	–			–
PVC	27.90%	4.68	2,422,825		–	2,422,825
Real estate	31.34%	1.93	339,114		–	339,114
Shipbuilding	8.24%	1.09	38,043			38,043
Stock exchange administration	28.29%	6.07	2,825,515		–	2,564,491
Technical rubber goods	14.60%	2.44	39,398,874	–	–	39,398,874
Turism	16.80%	4.27	2,405,376		77,409	2,220,830
Total	691.55%	123.36	17,412,277,524	550,810,675	1,102,621,978	7,142,861,468

assets related to companies listed on the Bucharest Stock Exchange. In this case the financial performance is 122.62% and the firm value index is 20.94, which translates into the fact that the market value of companies operating in this industry is approximately 21 times higher than their book value. Similar results are found for the companies operating in the energy industry.

For industries that rely less on intangible assets, indicators such as financial performance and firm value are below the values obtained by industries that have high values for intangible assets.

For this specific case – Bucharest Stock Exchange – we must consider that there are a wide range of factors that can affect a company's decision to invest in intangible assets, however there are only a limited number of studies that analyse these factors, which can moderate the relationship: company performance–investment in intangible assets.

5. Conclusions

The aim of this research was to analyse the effects of sub-components of intangible assets on firm value and the sustainable growth of firms listed on the Regulated Market of the Bucharest Stock Exchange (BSE), based on data from 2017 to 2019. The ordinary least squares (OLS) model through a linear regression was used to test the hypotheses. Intangible assets are increasingly recognized as a major driver of corporate competitiveness and sustainability. This study corroborates earlier findings and expands the understanding of intangible sub-components in enhancing financial performance and sustainable growth. The analysis shows that sub-components of intangible assets have an impact on sustainable growth and firm value in case of the Romanian listed companies. The proposed model indicates that sub-components of intangibles explain 0.229 of variance in SGR1, 0.347 of variance in SGR 2 and 0.484 of variance in FV.

It was found that innovative property (R&D and Patents) and IT Programs had no effect on sustainable growth rates (SGR1 and SGR2) for the companies listed at Bucharest Stock Exchange. In addition, the findings indicate that Patents had no influence on Firm Value. Moreover, R&D have a negative impact on Firm Value, even though according to the hypotheses a positive and significant relation was expected. This result may reflect the country's current state of economic and institutional development, Romania pertaining to the emergent economies category and more resources should be allocated to research and development, in order to support innovation and growth. At the same time, investment in R&D can be risky and the return on this item may spread over years. Many patents may provide only limited protection due to fast technological developments and can be created for strategic purposes only distantly related to firm's own innovation efforts. Thus, innovative property may not be perceived as positively affecting sustainable growth and firm value for this reason. However, the only sub-component that has a direct and positive effect on Firm Value is IT Programs. Given the ubiquity of computer technology as a pre-requisite for development in the digital economy, a positive relationship was expected, as companies in all industrial sectors rely nowadays on computerized information to conduct their business and to create value. These findings are in line with previous studies concerning emerging economies encountered in the literature, as well as with those indicating mixed results across companies and industrial sectors. As also emphasized by Albertini and Berger-Remy (2019), not all sub-components of IC contribute equally to a company's financial performance.

According to the regression results, Firm Performance, Industry, Loan to groups and Shares held in associates and jointly controlled entities are the most important variables for the proposed model. The impact of these variable in explaining the model is very high, because together they can explain 0.214 of variance for SGR1, 0.298 of variance for SGR2 and 0.402 of variance for FV. Moreover, as the results of the regression show, in case of FV, Shares

held in associates and jointly controlled entities can alone explain 0.355 of the variances. Furthermore, according to the results of the correlation matrix and collinearity statistics from regression analysis, variables categorised as economic competencies (Brands, Shares held in associates and jointly controlled entities) and firm structure-specific variables (Industry, Leverage, Firm Performance) seem to have a significant effect over SGR1, SGR 2 and FV. Shares held in associates and jointly controlled entities is the variable that can have the biggest impact when it comes to FV for listed companies at B.S.E. The explanation could be related to a reliance on financial assets and a traditional business model by Romanian companies, as in other emergent economies, unlike more innovative enterprises in developed countries, which capitalize more from intangibles' development. Another explanation of this result can be represented by the fact that all the analysed companies are listed on the Bucharest Stock Exchange. These companies know very well the advantages offered by the listing on the regulated market as well as the profitability rates offered by the shares of the listed companies. Therefore, some of the equity may have been invested to buy shares in listed companies that offer high returns.

5.1 Practical implications

Companies listed on the Regulated Market from the Bucharest Stock Exchange should maintain their scale of liabilities at a reasonable level when financing intangible assets in order to ensure corporate long-term and sustainable development. Also, these companies should maintain awareness about the importance of intangible assets and invest more in specific sub-components, in order to sustain competitive advantage. Recognizing the role of various IC components for organizational growth, as well as opportunities alongside the economic and institutional advancement, managers and entrepreneurs are encouraged to develop strategies to invest in and develop profitable intangibles, by reasonably allocating their limited resources, in order to achieve sustainable growth and increase company success.

5.2 Limitations

The study has some limitations. First, a smaller sample was used compared to a similar study by Xu and Wang (2018) or Ocak and Fındık (2019). Second, the sample covers only a period of three years, as data access and retrieval has been difficult and done manually. Third, companies that represent industries such as banking and IT&C are not represented within this analysis.

Limitations as the one presented, can affect the quality of the results, because:

(1) An analysis that includes more data over a longer period of time may provide more relevant results;

(2) Not including companies in the banking and IT&C industries can influence the results obtained because companies in these fields rely heavily on intangible assets. Banks implement digitization processes, which involve the use of technology and IT&C companies also rely on technology, patents and algorithms;

(3) Manual data collection from the annual financial statements of companies listed on the Bucharest Stock Exchange may lead to typing or calculation errors of financial indicators, which can have an impact on the calculation of sustainable growth rate and firm value;

5.3 Further research

Future research may use a larger sample and could extend the year range or alternative sustainable growth measures to the research model. The effect of different classification

made by some authors on firm value of the sustainable growth of firms may be tested in a future study. Also, more companies that activate in IT&C sector can be included in the model. Furthermore, companies that are not listed at Bucharest Stock Exchange should be included in the model.

The development of the proposed model, by collecting data over a longer period and including several companies from more diverse fields, including the banking and IT&C industry in Romania can play a very important role in developing a new tool for evaluating companies that operate on the Romanian market. In this way, the developed tool should not only be applied to companies listed on the stock exchange, but it could be applied also to companies which are not listed, with different dimensions and a different history. Identifying those intangible resources that contribute significantly to the value of the company and to the sustainable growth rate in the case of Romanian companies, can offer in the future a competitive advantage for the entrepreneurs who want to develop a sustainable start-up based on the extensive use of intangible resources (IT programs, patents, algorithms, databases). In this way an instrument can be developed that can predict the next unicorn that can emerge from the Romanian market.

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