

THE RELATION BETWEEN INTANGIBILITY AND ECONOMIC PERFORMANCE: A STUDY OF PUBLIC COMPANIES IN BRAZIL, RUSSIA, INDIA, CHINA AND SOUTH AFRICA (BRICS)

Sady Mazzioni

Doutorando em Ciências Contábeis e Administração
Universidade Regional de Blumenau - FURB
Rua Francisco Norberto Bonher, 55 E - Bairro Jardim Itália
CEP 89.802-530 Chapecó - SC
E-mail: sady@unochapeco.edu.br
Fones: (49) 3323-8243 / 9928-9520

Vitor Paulo Rigo

Mestrando do Programa de Pós-Graduação em Ciências Contábeis
Universidade Regional de Blumenau - FURB
Rua Antônio da Veiga, 140 – Sala D 202 - Bairro Victor Konder
CEP 89012-900 – Blumenau/SC – Brasil
E-mail: vprigo@gmail.com
Fone: (47) 3321 0565

Roberto Carlos Klann

Doutor em Contabilidade e Administração pela Universidade Regional de Blumenau - FURB
Professor da Universidade Regional de Blumenau - FURB
Rua Antônio da Veiga, 140, CEP: 89.012-900 - Blumenau, SC - Brasil
E-mail: rklann@furb.br
Fone: (47) 3321-0565

SUMMARY

The aim of our present study is to investigate the degree of intangibility and the economic performance of public companies in Brazil, Russia, India, China and South Africa. Descriptive, documentary and quantitative research was used to contextualize a research sample of businesses from the industrial, utilities and transport sectors. Data analysis was undertaken using multiple linear regression interpreting return on assets (ROA), earnings per share (EPS), sales growth (SG), asset turnover (AT) and return on equity (ROE) as dependent variables. As independent variables we considered the degree of intangibility of companies (DI) and dummy variables C1, C2, C3 and C4 to represent countries. In addition to the individual analysis of each country, the degree of intangibility (DI) for businesses was considered in terms of independent variables. Dummy variables C1, C2, C3 and C4 represented the countries, and variables S1 and S2 represented the economic sectors analyzed. To value test the hypothesis H_0 (that a relation does not exist between the degree of intangibility and economic performance), multivariate linear analysis was employed for 1.723 observations in 2009; 1.960 observations in 2010 and 2.083 observations in 2011. Over the periods analyzed, results indicated the presence of several statistically significant relationships for both dependent and independent variables, indicating the influence of the degree of intangibility for companies and their economic performance. The results obtained during these periods of analysis, thus effectively refute the H_0 hypothesis in favor of hypothesis H_1 , namely, that there exists a significant relationship between the degree of intangibility and economic performance as evidenced by our research sample.

Keywords: Intangible assets. Competitiveness. Economic performance. BRICS.

Área Temática: Contabilidade para Usuários Externos

1 INTRODUCTION

By no means a recent issue, intangible assets have proven fertile ground for discussion and research, attracting a renewed and increased interest from the academic and corporate worlds (KAYO, 2002; KAUFMANN; SCHNEIDER, 2004), especially since 2007, with Brazil having signaled adherence to international accounting standards, requiring such assets to be disclosed in financial statements.

Effective representation of intangible asset growth relative to tangible assets in the equity of companies and their relevance to the creation of value has been demonstrated by the research of Edvinsson and Malone (1998); Stewart (1998); Hoegh-Knivsfla and Krohn (2000); Schmidt and Santos (2002); Kanodia, Sapra and Venugopalan (2004); and Famá Perez (2006). These studies highlighted several causative factors including the continuous wave of takeovers and the fervency for market leadership. This involves the development or acquisition of leading brands; the global expansion of the utilities sectors; intellectual capital, the rate and extent of technological change (with particular reference to the impact of information technology) as well as the progressive integration of international financial markets. With this scenario, the traditionally heralded labor-capital relation lacks the scope and capacity to generate, and indeed, include, adequate competition, where copyrights; client portfolios; trademarks; patents and software must feature as new, important elements. Thus the work of Lapointe and Cimon (2009), asserts that intangibles are the most fitting way for companies to engage in the creation of sustainable value.

Likewise, the research of Martins (1972); Monobe (1986); Sveiby (1998); Stewart (1998); Hendriksen and Van Breda (1999); Lev (2001) and Kayo (2002) asserts that intangible assets are indeed seen by organizations as sources of competitive advantage, which can effectively contribute to the increase in company value. However, Nascimento et al. (2012), on the other hand, argue that contradictory results are all too often put forward by studies which seek to equate the degree of intangibility with performance, identifying a correlation in certain sectors and not in others. Among the studies which appeal to the greater the degree of intangibility the greater the profitability viability of a business equation, are those of Lev (2001); Perez and Famá (2006) and Colauto et al. (2009). Contrastingly, no such relation is put forward in the work of Cannoly and Hirshey (1984); Bontis, Keow and Richardson (2000); Antunes and Martins (2007); Esslin et al. (2009); Zéghal and Maaloul (2010); Carvalho, Kayo and Martin (2010) and Nascimento et al. (2012).

Kaufmann and Schneider (2004), in their literature review of research on intangible assets, highlighted a telling strength in specific geographical regions such as the United States and Scandinavia. Previously, Reina, Reina and Ensslin (2011) had surveyed a total of 53 international studies on intangible assets where findings indicated that empirical research was undertaken on Japan (1); the United Kingdom (1); New Zealand (1); Norway (2); Australia (4), and the United States (25). Some studies, moreover, were conducted in several countries (5) whilst others failed to record the site or region of application (14).

There is also an array of terminology hallmarking the talk and research on intangible assets. Kaufmann and Schneider (2004), for example, identify the most widely used and circulated terms: “intangibles”; “intangible capital”; “intangible resources”; “intellectual capital” and “intellectual property”. Stewart (1998) had previously classified intellectual capital into three basic forms: human capital; structural capital and client capital. This definition was consequently verified and expanded upon in further studies by Belkaoui-Riahi (2003) and that of Tan, Plowman and Hancock (2007).

Numerous studies have, furthermore, linked intellectual capital with the financial performance of companies: Bontis, Keow and Richardson (2000) in terms of Malaysian industry; Kamath (2000) for the Indian pharmaceutical sectors; Firer and Williams (2003) for public companies in South Africa; Chen, Cheng and Hwang (2005) for businesses in Taiwan;

Tan, Plowman and Hancock (2007) for companies listed on the Singapore stock exchange; Antunes and Martins (2007) in terms of Brazilian companies; Tovstiga and Tulugurova (2007) for companies in Russia; Bayburina and Golovko (2009) in terms of businesses within BRICS; Tovstiga and Tulugurova (2009) for small enterprises in Russia, Germany, Denmark and the United States; Maditinos et al. (2011) for Greek businesses; and Ahangar (2011) for a single company in Iran.

In this context, there is yet to be a study that partially or even fully assesses the relationship between organizational economic performance and intangibility for countries composing the BRICS grouping. Thus the research question to verify that the increase in the proportion of intangibles impacts upon the economic performance of companies within this geo-political region. Our present study differs from that of Bayburina and Golovko (2009) in three ways: (a) our study includes businesses in South Africa; (b) where the aforementioned study analyzed a sample of 115 companies, our study engages with a more robust research sample; (c) our study takes into account the relationship between the market value of shares and shareholder equity, while that of Bayburina and Golovko solely focuses on the composition of intellectual capital. In this way both studies differ in their approach to intangibility.

Bayburina e Golovko (2009), recount that the appellation "BRIC" was coined in 2003 by the economist Jim Neill in order to refer to Brazil, Russia, India and China. The rationale was to consider the symmetry of common characteristics for each of these countries: underestimated domestic financial assets; huge growth potential – countries that could be recognized as “developing” the GDP of which, by the year 2020, should exceed the volume of GDP for countries within the G-7. As a consequence, the acronym “BRIC” was upgraded to “BRICS” in order include South Africa. The countries composing BRICS thus constitute major economic powers and are now recognized as ranking among the world's wealthiest, that is, as key global players.

In light of the above, a central research question for our study is the following: what is the influence of the degree of intangibility on the varying economic performance of public companies in Brazil, Russia, India, China and South Africa? The central objective of our study is thus to scrutinize the statistically significant influence of the degree of intangibility (DI) upon the economic performance of public businesses within the BRICS grouping.

Our proposed study is further justified by virtue of the progressive surge of academic and corporate interest in intangible assets and value creation for shareholders. The relevance of our research is characterized by the applicability of results, the findings of which can contribute to the process of decision making. The research samples correspond to public companies located in countries composing BRICS which, as we have said, have symmetrical features (although they do not compose any common economic block). Because of this, our study holds value for accounting systems, investor relations, business managers, analysts, lenders, legislators, standard regulatory bodies, and researchers alike.

2 INTANGIBLE ASSETS

Companies primarily have two types of resources at their disposal: those that are necessary for the performance of operations and those that are vital for obtaining competitive advantages and strong financial performance. Belkaoui-Riahi (2003), for example, define operational features as being tangible: property; plants; equipment and physical technologies that are commonly placed on the market, easily imitable, substitutable and easily traded on the free market.

Yet as Barney shows (1991), resources capable of generating a sustainable competitive advantage and a superior financial performance, should bear the hallmarks of value: rarity; inimitableness; non-substitutable, thus becoming strategic assets. For Hall (1992), while many

types of intangible assets can indeed be classified as strategic, few, such as intellectual capital, display such fundamental characteristics. Thus Lev (2001) argues that the interest in intangibles is created, if not necessitated, not only by the intensified competition occurring in virtually all business sectors, but also by the globalization of trade, deregulation and the high technological changes that force companies to change their operating models and strategies.

Lev (2001) further expresses that innovation is primarily driven by investment into intangible assets. When such investments are commercially successful and protected by either patents or by plain anticipation alone, they are transformed into tangible goods, creating value growth for business. Yet at the same time, Lev highlights the shortcomings which weigh upon the accounting and reporting of intangible investments in the financial statements of companies. Thus, as Hendriksen and Van Breda (1999, p. 388) explain: “intangible assets constitute one of the most complex areas of accounting theory, in part due to the difficulties of definition, but principally due to the uncertainties in measuring value and estimation of use”.

Kaufmann and Schneider (2004), as with others in their research field, identify the mass of competitor terminology for intangibles. Despite the high level of interest among researchers on the subject, there is yet to be a clear consensus set for terms and definitions, or even a trend. It is also worth noting that different schools of thought address intangible assets in terms of shape; differentiation; composition; origin and benefits generated (REINA; REINA; ENSSLIN, 2011).

Borkowski (2001) puts forward the idea that intangibles are generally classified according to: (1) innovative patents; formulae; processes; *design*, or pattern; (2) copyright; composition; literary, musical or artistic composition; (3) registered brands; commercial or market name; (4) franchise or licensing agreements; (5) methods; system; process; campaigns; research; study; prognostic; client lists or technical data; or, (6) other intellectual property not mentioned.

Business entities, moreover, will often seek to expend resources or incur liabilities through the acquisition, development, maintenance and enhancement of intangible resources such as scientific or technical knowledge; the design and implementation of new processes or systems; licenses; intellectual property; market knowledge; name; reputation, image and trademarks (IAS 38).

Not all of these listed items, however, generally qualify as intangible assets, elsewhere understood as identifiable, controlled and as generating future economic benefits. Unlike the process of acquisition, and in relation to internally generated expected future earnings (goodwill), IAS 38 sets out what should not be recognized as an asset. Thus, a particular entity can assess costs incurred during phases of research and development in order to fulfill the qualifying criteria. Given this, during the research phase an asset is yet to acquire status and because of this costs will be incurred as expenses. During the developmental stage, if the entity demonstrates that the resulting asset meets criteria, this may then be accounted for as active expenditure, otherwise as expenses when incurred (IAS 38).

Hendriksen and Van Breda (1999) contest such a rationale in emphasizing that future periods will benefit from research and development to generate new products, improve old products or reduce future operating costs. Indeed a determined company promoting intense research activity may have a promising future and one that is not necessarily heading towards failure. Accordingly, if all of R & D activity is allocated as expense alone then there may be a short-term incentive to reduce such activities in order to raise profits, even though research is necessary to maintain market positioning and overall performance.

As Iudícibus (2000) puts forward, in the terms of R & D, cases should be examined individually. And where it is not possible to anticipate the effect of spending and the generation of future enterprise revenues, then these should be directly accounted as expenses. If, however, successful projects have been identified as generating future revenues, then at

least the direct costs can be activated to depreciate over periods in which such revenue is generated.

3 INTANGIBLE ASSETS AND ORGANIZATIONAL PERFORMANCE

The possible relationship between intangible assets and organizational performance is a recurrent theme in organizational studies. Sriram (2008) for example, analyzed the composition of a company's assets (tangible *versus* intangible) by using financial healthcare valuation models. The research sample was divided into two groups: (1) the bankruptcy of companies in the high technology market (software and computer services) and, (2) the bankruptcy of enterprises in traditional sectors. For every company in financial difficulty, a healthy company was included in the same segment. The results demonstrated that firms with significant intangible assets should take on board relevant, research studies so as to improve the financial health of the company. This said, financial variables nevertheless remain important to financial health, regardless of the composition of the assets and business model. Among the studies that do not identify a relationship between the degree of intangibility (DI) and organizational performance are those of Kamath (2000); Firer and Williams (2003); Antunes and Martins (2007); Esslin et al. (2009); Carvalho, Kayo and Martin (2010), and Nascimento et al. (2012).

Kamath (2000) studied as to whether a relationship exists between intellectual capital components - IC (human, structural and physical capital) and traditional measures of company performance (profitability, productivity and market valuation). The research sample consisted of the 25 largest pharmaceutical companies in India, based on sales in 2006 – this, representing approximately 70 percent of total sales and assets of the pharmaceutical industry in 2006. The analysis of empirical results failed to establish any significant relationship between the performance of pharmaceutical companies in terms of market valuation, productivity and profitability with any of the components of IC, in India. Company performance was thus sooner understood in terms of tangible assets rather than intangibles.

Firer and Williams (2003) studied the association between the efficiency of value added (VA), through the main components of a company's base resources (physical capital, human capital and structural capital), and three traditional dimensions of business performance: market valuation, productivity and profitability. Their research sample was based on 75 public companies in South Africa from four intensive sectors of intellectual capital: banking, electronics, information technology and utilities. The empirical findings did not identify a link between the efficiency of value added (VA), the principal base components of resources and corporate profitability, this, suggesting that physical capital remains the most significant, underlying feature of business performance in South Africa.

Antunes and Martins (2007) studied the relationship between the managerial awareness of Intellectual Capital and corporate performance so as to test how far existing performance measures can harness the effects of investments on the elements composing intellectual capital in 30 major Brazilian companies. The findings indicated that the concept of intellectual capital as understood and expressed by managers mirrored the recent literature. There was not, moreover, any correlation between performance indicators and the amount invested in intellectual capital.

Carvalho, Kayo and Martin (2010) analyzed resources and their effect on both intangible and tangible business performance in relation to competitors, by using a sample of 228 Brazilian companies from various economic sectors. The results for the analyzed sample showed that the intangibility of resources did not guarantee a sustainable competitive advantage, and that such features yield little influence on the superior performance of companies: it was precisely the tangibility of resources which contributed significantly to the superior performance of firms from diverse economic sectors.

Nascimento et al. (2012) studied the existing correlations between the degree of intangibility (DI) and performance indicators, the asset turnover (AT), net margin (NM), return on assets (ROA) and the return on equity (ROE) of eight companies from the information technology sector and 20 telecommunications companies – all Bovespa listed. Results showed little difference between the analyzed segments, and the asset turnover did not evidence a statistically significant correlation with the performance indices used. Descriptive and statistical analysis indicated that companies belonging to the information technology sector, had an above industry average DI, yet, despite this, no major financial or economic gains were evidenced. The telecommunications industry indeed was found to demonstrate a positive influence of DI, albeit statistically weak.

The findings of Kamath (2000); Firer and Williams (2003); Antunes and Martins (2007); Carvalho, Kayo and Martin (2010), and Nascimento et al. (2012), attest to the null hypothesis of our study, that being:

H₀ - a relation does not exist between the degree of intangibility and the economic performance of businesses.

Chen, Cheng and Hwang (2005) sooner posit that although generally accepted accounting standards restrict the recognition of intellectual capital through financial statements, investors still understand their invisible value, finding positive correlations between intangible assets and organizational performance. Similarly, the work of Bontis, Keow and Richardson (2000); Perez and Famá (2006); Tan, Plowman and Hancock (2007); Colauto et al. (2009); Ahangar (2011), and Maditinos et al. (2011) affirm such patterns.

Bontis, Keow and Richardson (2000), investigated the three elements of intellectual capital (human, structural and client capital) and the interrelations within the Malaysian industrial and utilities sectors. Data was collated through questionnaires and results showed: (1) the importance of human capital whatever the industry, (2) that client capital has a significant influence on structural capital, whatever the industry, and finally, (3) that the development of structural capital has a positive relation to negotiation performance, whatever the industry.

Chen, Cheng and Hwang (2005) empirically assessed the relationship between the intellectual capital of businesses and the relation between market value and book value by means of 4.254 observations of Taiwanese companies from 1992 to 2002, all of which were listed on the TSEC. The findings signaled intellectual capital to be increasingly recognized as an important, strategic asset for the sustainable competitive advantage of businesses: investors place greater value on firms which have efficient intellectual capital. Companies with a better efficiency of intellectual capital generate higher profitability and revenue growth in current and subsequent years. Such results, furthermore, highlight the importance of intellectual capital in improving the profitability and revenue growth of companies.

Perez and Famá (2006) studied the impact of intangible assets on company economic performance. This was measured by the generation of value for shareholders, where intangible-intensive companies are creating more value than tangible-intensive companies. The research sample was composed of 699 non-financial companies (members of the Stern Stewart Performance rankings) with shares traded on the NYSE (New York Stock Exchange) and NASDAQ (National Association Securities Dealers Automated Quotation), from 1997 to 2002. Research findings indicated that intangible assets were relevant to the economic performance of the analyzed entities: companies with a higher proportion of intangible assets generated more value for shareholders. Perez and Famá (2006, p. 23) in conclusion thus asserted that, “the results were so clear for the analyzed period, showing that companies tangible assets only furnish normal profits with real value creation provided by intangible assets.”

Tan, Plowman and Hancock (2007) investigated the relation between intellectual capital (IC) and the financial performance of 150 firms listing on the Singapore Stock Exchange, between 2000 and 2002. The results demonstrated that IC and company performance are positively related: IC is correlated with a company's future performance and the growth rate of a company's IC is positively related to company performance. This said, the contribution of IC to business performance differs with the type of industry and is by no means uniform.

Tovstiga and Tulugurova (2007) researched the impact of intellectual capital practices on business performance in the context of innovative enterprises within the region of St. Petersburg, Russia. The sample consisted of 20 companies in the high technology sector, working primarily on the development of devices for techno-scientific production and software. The results of the study identified IC as the most important factor driving competitive market performance.

Colauto et al. (2009) investigated the possible correlation between the information available on intangible assets and the economic performance of enterprises. This was done in order to assess the impact of information dissemination and the generation of economic value for the concerned entities. Using a sample of 80 companies with a national corporate governance level of BMF & Bovespa, results indicated that the parametric (Pearson) and nonparametric (Spearman) correlations were insubstantial, although more significant for companies of the New Market (*Novo Mercado*).

Bayburina and Golovko (2009) evaluated the influence of certain components of intellectual capital on the intellectual value of companies from the BRIC block. The analysis of panel data revealed that human capital is a key factor in the long-term growth of companies from all BRIC sectors.

Tovstiga and Tulugurova (2009) analyzed and compared the impact of intellectual capital on competitive business performance in the context of 122 small yet innovative businesses located in four specific regions: Russia (42); Germany (40); Denmark (22), and the United States (18). The research demonstrated that IC is regarded as the most important factor driving competitive performance in all regions.

Ahangar (2011) investigated the association between the efficiency of the basis of value added (physical, human and structural capital) and three dimensions of corporate financial performance (return on assets, sales growth and employee productivity), using a company environment in Iran as a study, with data collated over 30 years. The findings revealed that the AV of main resource components and the three dimensions of corporate performance are mixed. Overall, results suggested human capital to be more effective than structural and physical capital in terms of the efficient creation of value.

Maditinos et al. (2011) analyzed the impact of intellectual capital on the market value of firms and their financial performance. The sample consisted of 96 Greek companies listed on the Athens Stock Exchange (ASE), from four different economic sectors between 2006 and 2008. Results evidenced a statistically significant relationship between the efficiency of human capital and financial performance. Maditinos et al concluded that in the context of Greek business and enterprise, the development of human resources appears to be a major factor for economic success.

The research of Bontis, Keow and Richardson (2000); Chen, Cheng and Hwang (2005); Perez and Famá (2006); Tan, Plowman and Hancock (2007); Tovstiga and Tulugurova (2007, 2009); Colauto et al. (2009); Bayburina and Golovko (2009), Ahangar (2011) and Maditinos et al. (2011) thus present us with an alternative hypothesis, namely:

H1 – a relationship exists between the degree of intangibility and the economic performance of companies.

4 METHODOLOGY

The characteristics of the study allow us to draw upon descriptive research, quantitative data and source documents. The studied population consists of publicly traded companies from diverse economic sectors within Brazil, Russia, India, China and South Africa (BRICS); their financial information held with Thomson®.

Table 1 shows the composition of the sample population in terms of country and economic sector.

Table 1: Sample by country and economic sector

COUNTRY	INDÚSTRY			UTILITIES			TRANSPORT			TOTAL		
	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
Brazil	125	132	129	34	35	35	5	5	5	164	172	169
Russia	80	84	80	55	59	58	1	1	1	136	144	139
India	328	373	397	21	24	25	11	11	11	360	408	433
China	869	1.022	1.126	50	53	55	38	43	44	957	1.118	1.225
S. Africa	98	110	110	2	2	2	6	6	5	106	118	117
TOTAIS	1.500	1.721	1.842	162	173	175	61	66	66	1.723	1.960	2.083

Source: Research data

A total number of 3,540 companies were listed in the Thomson® database at the time of research. Companies that had gross revenues of less than \$ 160 million were excluded from the present study. Businesses from the financial and insurance sectors which presented extreme values (without economic justification) were also excluded, these being a total of nine in 2009, nine in 2010 and sixteen in 2011. Large companies were considered in terms of revenue, the amount equating to approximately 300 million Reals (R\$) (in line with the range established by Law 11.638/2007 and the National Bank for Economic Development - BNES).

In this way the integrity of the research sample was maintained in being comprised of publicly traded companies based in Brazil, Russia, India, China and South Africa (BRICS), members of the industry, utilities and transportation sectors, listed on the Thomson® database from which were obtained the indicators comprising the study variables (Chart 1).

According to Deloitte (2012), BRICS countries vary in their adoption of IFRS (International Financial Reporting Standards): for Brazil (and all Banks within its territory), IFRS became mandatory as of 2010; Russia does not recognize IFRS, and for India, IFRS are only allowed for consolidated financial statements of companies listed on the stock exchange. The effective date of adoption, moreover, was postponed without a new date being indicated. China's new Chinese Accounting Standards (CAS), moreover, were published in 2006 and effective as of January 1, 2007. These standards are substantially consistent with IFRS, save for minor changes that reflect the specific circumstances and environment in China. In terms of South Africa, IFRS is mandatory for all listed companies.

4.1 Variables

Ahangar (2011) points out that there is yet to emerge a specific theoretical perspective, or adequate empirical evidence, justifying the advantage of any specific measure over other proxy. For the analysis of our present study, dependent and independent variables were used, as shown in Chart 1.

Chart 1 – Research Variables

Dependent Variables	Proxy
1. Return On Assets (ROA)	$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$
2. Sales Growth (SG)	$SG = \left(\frac{\text{Current yearly sales} - \text{Previous year sales}}{\text{Previous year sales}} \right) - 1 \times 100$
3. Asset Turnover (AT)	$At = \frac{\text{Sales}}{\text{Total Asset}}$

4. Earnings Per Share (EPS)	$EPS = \frac{\text{Net Income}}{\text{Number of shares}}$
5. Return on Equity (ROE)	$ROE = \frac{\text{Net Income}}{\text{Net Equity}}$
Independent Variables	Proxy
6. Degree of Intangibility (DI)	$DI = \frac{\text{Total Market Value of Shares}}{\text{Shareholder Equity}}$
7. Economic Sector	Industry; Utilities; Transport; (see Chart 2).
8. Country of origin	Brazil (1 - yes; 0 - no); Russia (1 - yes; 0 - no); India (1 - yes; 0 - no); China (1 - yes; 0 - no); South Africa (1 -yes; 0 - no); (see chart 3).

Source: Research Data.

The following measures were thus considered for each dependent and independent variable: (1) Profitability (ROA): is the ratio of net income divided by the book value of total assets as reported in annual reports (FIRER; WILLIAMS, 2003; CHEN; CHENG; HWANG, 2005; AHANGAR, 2011); (2) Sales Growth (SG): measures changes in current year sales with previous year sales, signaling the prospect of company growth (CHEN; CHENG; HWANG, 2005; AHANGAR, 2011); (3) Productivity (AT): indicates the ratio between total revenue and the book value of total assets (FIRER; WILLIAMS, 2003; KAMATH, 2008); (4) Performance (EPS): is the relation between net profit divided by the number of shares. This, a commonly used measure in the analysis of businesses in financial markets, (TAN; PLOWMAN; HANCOCK, 2007); (5) Return On Equity (ROE): is the ratio of net income divided by the book value of shareholder equity as reported in annual reports (FIRER; WILLIAMS, 2003; CHEN; CHENG; HWANG, 2005); (5) Degree of Intangibility (DI): is a relative measure: the higher the DI index, the greater the relative share of intangible assets in the company structure. (KAYO, 2002; PEREZ; FAMÁ, 2006); (6) Economic sector: *dummy* variable representing types of economic activity; (7) Country: *dummy* variable representing a firm's country of origin.

Secondary data were collated from the Thomson® database covering 2009, 2010 and 2011. The statistical package SPSS® was used for data analysis, and a multivariate linear regression technique applied.

4.2 Limitations of Study

Hair et al. (2009) note that sample size can influence statistical significance, for both large and small research samples. The results of our study should thus be analyzed with due care, owing to the extent and quantity of elements composing the research sample. VIF (*Variance Inflation Factor*) measures the extent to which the variance of each estimated regression coefficient increases with co-linearity (FÁVERO et al. 2009). The results of our research are well within acceptable parameters, as set out by Hair et al. (2009).

The Durbin-Watson statistic (for the autocorrelation of residuals) and the Pesarán-Pesarán tests used in our research, did however furnish certain unexpected results: indicators were observed as falling short of the desired SG2009 and SG2010 dependent variables, related to the independent variables, indicating the presence of multicollinearity in residuals. *Pesarán-Pesarán* testing revealed that the behavior of residuals for ROA2009; AT2009; ROE2009; AT2010; ROE2010, and ROE2011 variables evidenced heteroscedasticity (CUNHA; COELHO, 2012), this being more intense in 2009, but gradually reducing over 2010 and 2011. Multicollinearity and heteroscedasticity indicate that estimators for the model are still linear, unbiased, consistent and normal, but can interfere with the accuracy of estimators for regression coefficients.

5 THE ANALYSIS AND INTERPRETATION OF RESULTS

In order to investigate the influence of the degree of intangibility (DI) on the economic performance of BRICS public companies, analyses were undertaken of entities that met research and sample requirements (as outlined in the methodology and Table 1).

5.1 Analysis of Results for 2009

Table 2 lists the descriptive statistics for the DI2009 variable, in terms of country.

Table 2 – Descriptive Statistics for DI2009

DI2009	Minimum	Maximum	Average	Standard Deviation
Brazil	-13,4635	98,7523	2,9050	8,6333
Russia	-0,2739	146,6365	2,7227	13,0055
India	-5,0344	135,8097	4,0278	8,2248
China	-24,4040	170,7610	4,2335	6,3295
South Africa	0,2041	23,0209	3,2400	3,6319
DI2009	-24,4040	170,7610	3,8837	7,6000

Source: Research data.

As can be seen in Table 2, China and India are the sole countries that have a DI above the BRICS average. China has the highest maximum, and Russia the largest standard deviation. China and South Africa have a below average standard deviation. To test the hypotheses of our study, a multivariate linear regression technique was employed for the variables listed in Chart 1. For the three economic sectors investigated (industry, transport and utilities), we used two dummy variables, in following Fávero et al. (2009), as shown in Chart 2.

Chart 2 – Dummies used for the economic sector variable

Economic Sector	<i>Dummies</i>	
	A ₁	A ₂
Industry	0	0
Utilities	1	0
Transport	0	1

Source: an elaboration of FÁVERO et al. (2009).

With this measure, the industry sector becomes a control variable, chosen because it is the activity with the largest number of companies. Multiple linear regressions were generated for each independent variable, this allowing us to observe the separate influence of each activity on economic performance. Four *dummy* variables (n-1), based on the findings of Favero et al (2009), enabled the five countries (Brazil, Russia, India, China and South Africa) to be investigated simultaneously, as detailed in Chart 3.

Chart 3 – Dummies used for the country variable

Countries	<i>Dummies</i>			
	C ₁	C ₂	C ₃	C ₄
China	0	0	0	0
India	1	0	0	0
Brazil	0	1	0	0
Russia	0	0	1	0
South Africa	0	0	0	1

Source: an elaboration of FÁVERO et al. (2009).

China is the control variable, for it is the country with the largest number of companies constituting the research sample. Table 3 details the multiple linear regression of the relationship between ROA; EPS; SG; AT; ROE variables, the degree of intangibility, economic sectors and the five host countries.

Table 3 – Results of multiple linear regression for 2009 (BRICS)

	ROA	EPS	SG	AT	ROE
R ² adjusted	0,040	0,022	0,013	0,079	0,075

F	11,269		6,528		4,131		22,110		20,935	
Significance	*0,000		*0,000		*0,000		*0,000		*0,000	
Variables	Coef. B.	T	Coef. B.	T	Coef. B.	t	Coef. B	T	Coef. B	T
(Constant)	0,038	*13,719	-0,519	-1,010	13,451	*7,928	0,800	*25,857	0,180	*7,751
DI2009	0,002	*6,455	0,174	*3,815	0,285	***1,893	0,010	*3,548	-0,024	*-11,530
C1	0,010	**2,009	0,285	0,321	6,845	**2,340	0,148	*2,766	0,015	0,372
C2	0,014	**2,026	0,588	0,479	-6,661	-1,643	0,006	0,078	-0,096	***-1,742
C3	-0,009	-1,193	7,786	*5,611	-14,964	*-3,264	0,724	*8,653	-0,198	*-3,164
C4	0,041	*5,109	0,452	0,308	-4,125	-0,850	0,677	*7,646	0,094	1,425
S1	0,003	0,471	-2,683	** -2,114	8,272	**1,974	0,096	1,257	0,078	1,366
S2	-0,023	** -2,258	-0,277	-0,149	-6,438	-1,048	-0,255	** -2,273	-0,036	-0,433

n = 1.723. *significant to a level of 1%; ** significant to a level of 5%; *** significant to a level of 10%.

C1 = India; C2 = Brazil; C3 = Russia; C4 = South Africa = 1; S1 = Utilities; S2 = Transport;

Source: Research data.

Table 3 indicates a significant statistical relation at the level of 1% for all dependent and independent variables. In terms of the degree of intangibility (DI2009), there is a positive, statistically significant relation at the level of 1% for ROA, EPS, AT and 10% for SG. ROE is negative and statistically significant at 1%. This indicates that in all businesses with greater intangibility a return on assets, earnings per share, asset turnover and higher sales growth is evidenced, and, at the same time, a lower return on net equity.

With respect to economic sectors, the utilities sector has a significantly positive relationship with 5% SG, and a negative EPS of 5%. In terms of transport, a statistically negative relation is evidenced at 10% for ROA and AT variables. Utilities activity boasts a comparatively higher positive relationship with industry for all variables, and transport activity has a higher ratio, albeit for the EPS variable.

India presents a statistically significant relation with an AT variable of 1% and ROA and SG at 5%. Brazil demonstrates a statistically positive relation with ROA at 5% and a negative ROE of 10%. For Russia, a notable, positive relation is evidenced at the level of 1% for EPS and AT (1%), and a negative relation can be observed in terms of SG and ROE (1%). With South Africa, there is a positive and statistically significant relationship with ROA and AT (1%).

As established, China is the control country with the highest average of intangibility (Table 2). Its companies presented mixed and non-uniform results in comparison to businesses in Brazil, Russia and South Africa. What's more, companies in India evidenced superior results to China in terms of all variables.

5.2 Analysis of Results for 2010

Table 4 presents the descriptive statistics corresponding to the DI2010 variable, in terms of country.

Table 4 – Descriptive statistics for DI2010

DI2010	Minimum	Maximum	Average	Standard Deviation
Brazil	-2,6289	294,8107	3,6738	22,4798
Russia	-25,9058	136,5651	2,4257	11,6048
India	-9,6109	74,8928	3,6219	5,6778
China	-49,9849	448,3252	4,3590	13,8530
South Africa	0,2656	25,3180	3,1832	3,2042
DI2010	-49,9849	448,3252	3,9326	13,0769

Source: Research data.

In table 4, China has the highest degree of intangibility (DI) –the only country with a higher than average overall indicator. Brazil, which in 2009 had the fourth best average, is

now tabled as second best. However, it is the country with the highest standard deviation, indicating greater variance from the average. Table 5 displays the results of multiple linear regression in terms of ROA; ROA; EPS; SG; AT, and ROE variables; the degree of intangibility (DI), economic sectors and the five sampled countries (BRICS).

Table 5 – Results of multiple linear regression for 2010 (BRICS)

	ROA		EPS		SG		AT		ROE	
R ² adjusted	0,011		0,031		0,039		0,082		0,468	
F	4,160		9,871		12,277		25,879		247,194	
Significance	*0,000		*0,000		*0,000		*0,000		*0,000	
Variables	Coef. B.	T	Coef. B.	t	Coef. B.	T	Coef. B.	T	Coef. B.	t
(Constant)	0,051	*20,59	0,180	0,318	38,487	*24,379	0,860	*31,997	0,215	*18,070
DI 2009	0,000	*2,802	0,045	1,449	-0,005	-0,058	0,003	**2,193	-0,027	*-41,430
C1	0,014	*2,958	0,425	0,411	-20,818	*-7,186	0,069	1,398	0,039	***1,770
C2	0,019	*2,857	0,689	0,464	-9,996	**2,407	-0,049	-0,693	0,024	0,752
C3	0,015	***1,951	13,585	*8,086	-8,511	***-1,811	0,824	*10,301	0,020	0,551
C4	0,022	*2,896	0,397	0,229	-30,092	*-6,207	0,560	*6,794	0,048	1,315
C1	-0,007	-1,067	-4,999	*-3,275	-8,257	***-1,934	0,115	1,587	0,009	0,293
C2	-0,011	-1,089	-0,521	-0,232	8,828	1,404	-0,212	**1,986	-0,065	-1,376

n = 1.960. * significant to a level of 1%; ** significant to a level of 5%; *** significant to a level of 10%.

C1 = India; C2 = Brazil; C3 = Russia; C4 = South Africa = 1; S1 = Utilities; S2 = Transport

Source: Research data.

With Table 5, we can observe a statistically significant relation pegged at 1% for all dependent and independent variables. In terms of the degree of intangibility (DI) there is a significant, statistically positive relation of 1% for ROA and 5% AT, notwithstanding the statistically negative relation of 1% ROE. This indicates that in all businesses with greater intangibility, greater share return and asset turnover are evidenced, as is a lower return on net equity.

In relation to economic sectors, the utilities sector has a significantly negative relation with 5% EPS and 10% SG. In terms of transport, a significant, statistically negative relation can be seen relation at 5% for the AT variable. Utilities activity sees a comparatively higher positive relationship with industry in terms of AT and ROE variables, and transport activity has a higher ratio, albeit for the SG variable.

For the countries: India presents a positive, statistically significant relation with a ROA of 1%, ROE of 10%, as well as a negative relation in terms of SG – pegged at 1%. Brazil evidences a statistically significant positive relation for ROA (1%), and negative in terms of SG (10%). Russia presents a positive statistically significant relation in terms of EPS, AT (1%) and ROA (10%). A significantly negative relation is also evidenced in terms of SG (10%). With South Africa there is both a statistically significant, positive and negative relation with ROA and AT (1%), and a negative SG of 1%.

It is interesting to note that when comparing the performance of other countries with China (which is the control variable and the country possessing the highest degree of intangibility within the research sample), we find that the results, are yet again, mixed. Chinese Companies evidenced better performance in terms of the SG variable, and in comparison with Brazil, Chinese businesses demonstrated a better AT. For all other situations, however, the performance of Chinese businesses was lower.

5.3 Analysis of Results for 2011

Table 6 details the descriptive statistics for DI2011, by country.

Table 6 – Descriptive characteristics for DI2011

DI2011	Minimum	Maximum	Average	Standard Deviation
Brazil	-7,3924	120,3331	2,1945	9,4782
Russia	-132,4031	10,2786	0,2565	11,4296
India	-0,5358	141,8627	2,2087	7,4383
China	-21,9077	336,8404	2,7359	9,8421
South Africa	0,2152	16,8287	2,3515	2,4490
DI2011	-132,4031	336,8404	2,3954	9,2225

Source: Research results

As with 2009 and 2010, businesses in China presented the highest average in terms of the degree of intangibility for BRICS countries in 2011. This, signaling that China was the only country from BRICS to evidence an above average performance in 2011. South Africa did not present a negative degree of intangibility and evidenced the lesser standard deviation, this, indicating results closer to the average. For Companies in Russia, an average far lower than that of other countries was shown.

Table 7 displays the results of multiple linear regression between ROA; EPS; SG; AT, and ROE variables; the degree of intangibility; economic sectors and the five countries studies (BRICS), with reference to 2011.

Table 7 details a statistically significant relation at the level of 1% for all dependent and independent variables. In terms of the degree of intangibility (DI), a positive, statistically significant relationship is observed at 1% for AT and ROE. This indicates that for the total number of businesses, those with greater intangibility have a greater return on shares and equity. It is also evidenced that the important change in the relationship between the DI and the ROE for 2011 is reflective of preceding years where the relation was significant and negative. The DI in 2011, furthermore, is different to preceding years and evidences a positive relation with all performance variables.

Table 7 – Results of multiple linear regression for 2011 (BRICS)

	ROA		EPS		SG		AT		ROE	
R ² adjusted	0,007		0,041		0,007		0,071		0,008	
F	3,005		13,706		3,113		23,633		3,477	
Significance	*0,004		*0,000		*0,003		*0,000		*0,001	
Variables	Coef. B.	T	Coef. B.	t	Coef. B.	T	Coef. B.	T	Coef. B.	T
(Constant)	0,045	*15,096	0,109	***1,772	27,414	*16,684	0,878	*35,721	0,053	*2,805
DI 2009	0,000	1,152	0,003	0,635	0,136	1,036	0,006	*3,243	0,006	*4,221
C1	0,016	*2,920	0,493	*4,304	-2,251	-0,733	0,072	1,560	0,011	0,316
C2	-0,001	-0,073	0,017	0,098	-12,782	*-2,797	-0,075	-1,101	0,043	0,824
C3	0,012	1,311	1,593	*8,173	-2,052	-0,393	0,781	*9,996	-0,071	-1,180
C4	0,024	**2,520	0,937	*4,726	-15,621	*-2,939	0,534	*6,715	0,085	1,392
S1	-0,018	** -2,171	-0,612	*-3,528	-8,318	***-1,788	-0,007	-0,105	0,041	0,767
S2	-0,013	-1,011	-0,141	-0,548	4,583	0,666	-0,209	** -2,027	-0,084	-1,063

n = 2.083. * * significant to a level of 1%; * significant to a level of 5%; *** * significant to a level of 10%.

C1 = India; C2 = Brazil; C3 = Russia; C4 = South Africa = 1; S1 = Utilities; S2 = Transport

Source: Research data

For the economic sectors, utilities presented a significant and negative relation in terms of EPS (1%); ROA (5%), and SG (10%). The transport sector evidenced a statistically significant and negative relation at the level of 5% for the AT variable alone. Utilities presented the strongest positive relation when compared to industry, albeit for the ROE variable. The transport sector, in comparison, evidenced a greater relation, albeit for the SG variable.

India evidenced a statistically significant and negative relation in terms of the ROA and EPS variable (1%). Brazil meanwhile, evidenced a statistically significant and negative

relation at the level of 1% SG. For Russia, we can observe a positive, significant relation of 1% for EPS and AT. In terms of South Africa, a positive and statistically significant relation is evidenced with EPS, AT (1%), and ROA (5%), with a negative SG of 1%.

In comparing the results of other countries with the control country, it can be seen that again the highest degree of intangibility (DI) of Chinese businesses resulted in better performance, this, related to sales growth (SG). However, results for other variables were generally worse than that other BRICS countries companies, with few exceptions.

As Lev (2001) notes, research conducted in the United States with companies comprising the S & P 500 showed growth in the relationship between market value and book value, at an increasing ratio of six to one in the 1980s right up until the 2000s (the market value was on average six times greater than the carrying value). Comparatively, the results of our study highlight that in terms of BRICS, Companies also have a higher proportion of intangible assets in relation to tangible assets, albeit to a lesser extent than in corporate America.

6 CONCLUDING REMARKS

The aim of our present study was to investigate the influence of the degree of intangibility (DI) on the economic performance variables of publicly traded companies in Brazil, Russia, India, China and South Africa – countries composing BRICS. To achieve the research objectives, descriptive, documentary and quantitative research was employed for a large sample of companies (1.723 in 2008; 1.960 in 2009 and 2.083 in 2011), from the industry, utilities and transport sectors.

Analysis of research data was undertaken using multivariate linear regression through which Return On Assets (ROA); Earnings Per Share (EPS); Sales Growth (SG); Asset Turnover (AT) and Return On Equity (ROE) were considered as dependent variables. As independent variables we considered the degree of intangibility for companies (DI), understood as the relationship between a Company's market value the value of shareholder' equity. We used dummy variables C1, C2, C3 and C4 to represent countries jointly and variables S1 and S2 to represent the economic sectors involved.

The testing of hypothesis H_0 , proceeded by the multivariate analysis of data from 2009, 2010 and 2011. Results indicated several statistically significant relationships of dependent and independent variables, this, evidencing a relationship between the degree of intangibility of companies and their economic performance. Specifically in relation to the independent degree of intangibility variable (DI) a positive and statistically significant relationship with dependent variables was observed, as presented in Table 8.

Table 8 – The relation between the degree of tangibility (DI) and dependent variables

Variables	ROA	EPS	SG	AT	ROE
DI2009	+1%	+1%	+10%	+1%	-1%
DI2010	+1%	+	-	+5%	-1%
DI2011	+	+	+	+1%	+1%

Source: Research data

Many of the results pertaining to our present research study are indicative of previous investigations, notably those of Bontis, Keow and Richardson (2000); Chen, Cheng and Hwang (2005); Perez and Famá (2006); Tan, Plowman and Hancock (2007); Tovstiga and Tulugurova (2007, 2009); Colauto et al. (2009); Ahangar (2011), and Maditinos et al. (2011).

From these results, it is thus possible to refute hypothesis H_0 in favor of hypothesis H_1 , where a relation between the degree of intangibility and economic performance is attested through our research sample and the periods therein investigated.

It can be concluded that the degree of intangibility (DI) had a bearing on the economic development of the research sample, evidencing a statistically significant relation with ROA;

EPS; SG and AT, for the five countries over the period investigated. There was, however, no uniform behavior with respect to the ROE independent variable, presenting a negative and statistically significant relation in 2009, 2010 and 2011.

Our research contributes to research of intangible assets, in that its results evidence the significant degree of intangibility and its relationship with the economic performance of businesses in BRICS countries. That BRICS is undergoing continual expansion in all areas and constituting landscape of the modern economic world, our study attains its research objective. The research results incontestably indicate that the presence of intangibles improve organizational performance, given the significant relationship of this variable with the different performance variables used.

Although the greater degree of intangibility was presented by Chinese companies, evidencing better performance in sales growth compared to other countries same performance was not evidenced for other variables (with few exceptions) over the three years investigated.

It would be both worthy and important for future studies to investigate the particular factors affecting the condition of Chinese enterprises, which are in the process of expanding sales yet without generating a significant impact on other performance variables. Another issue to be addressed, is as to whether the adoption of IFRS at different times, may have had substantial effects on results.

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