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IMPACT OF INVESTMENTS IN INTANGIBLE RESOURCES ON BUSINESS PERFORMANCE

IMPACTO DOS INVESTIMENTOS EM RECURSOS INTANGÍVEIS NO DESEMPENHO ORGANIZACIONAL

IMPACTO DE LAS INVERSIONES EN RECURSOS INTANGIBLES SOBRE EL DESEMPEÑO ORGANIZACIONAL

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ABSTRACT

In this research, we explored the relationship between investments in intangible resources and the performance of publicly traded banks. We applied a quantitative approach, based on hand-collected public data from banks' financial statements of investments on intangible resources, combined with a history of trading and accounting values, covering the period from 2008 to 2015. The results suggest that investments in intangible resources provide superior performance. The banking sector is not particularly sensitive to investments on Human Intangible Resources (HR) and Relation Intangible Resources (RR), but respond in an economically significant way to investments on Structural or Organizational Intangible Resources (SR).

Keywords: Intangible Resources; Performance; Resource-Based View; Brazilian Banks.

RESUMO

Nesta pesquisa, exploramos a relação entre investimentos em recursos intangíveis e o desempenho de bancos de capital aberto. Utilizamos uma abordagem quantitativa, baseada em dados secundários coletados manualmente nos demonstrativos financeiros dos bancos sobre os investimentos em recursos intangíveis e valores de mercado e contábeis, no período de 2008 a 2015. Os resultados sugerem que os investimentos em recursos intangíveis proporcionam desempenho superior. O setor bancário não é particularmente sensível aos investimentos em Recursos Intangíveis Humanos (RH) e de Relacionamento (RR), mas respondem de forma significativa, do ponto de vista econômico, aos investimentos em Recursos Intangíveis Estruturais ou Organizacionais (RE).

Palavras-chave: Recursos Intangíveis; Desempenho; Visão Baseada Nos Recursos; Bancos Brasileiros.

RESUMEN

En esta investigación, exploramos la relación entre inversiones en recursos intangibles y el desempeño de los bancos que cotizan en bolsa. Utilizamos un enfoque cuantitativo, basado en datos secundarios presentes en los estados financieros acerca de las inversiones en recursos intangibles y valores de mercado y contables, en el período de 2008 a 2015. Los resultados sugieren que las inversiones en recursos intangibles proporcionan un rendimiento superior. El sector bancario no es particularmente sensible a las inversiones en Recursos Intangibles Humanos (RH) y de Relación (RR), pero responden de manera económicamente significativa a las inversiones en Recursos Intangibles Estructurales u Organizacionales (RE).

Palabras clave: Recursos Intangibles; Desempeño; Vista Basada En Recursos; Bancos Brasileños.

1 INTRODUCTION

In this paper, we examine how the investment in intangible resources (human, structural or organizational and relational) by Brazilian publicly traded Banks affect their performance, in terms of accounting and market returns. Making use of hand-collected data about banks investments on intangible resources, we contribute to the extant literature by focusing on the theoretical and empirical research gap regarding the relationship between intangible resources and organizational performance.

Strategic business management aims to understand why some organizations perform better than others (COSTA; COOL; DIERICKX, 2013; GANS; RYALL, 2017). A relevant objective within this research field is to explain the factors that drive the heterogeneity in companies' performances. One of the main streams of the literature on performance is the Resource-Based View (RBV), in which resources and capabilities that organizations control are the focal unit of analysis. According to Barney (1991), these resources will provide a competitive advantage to the organization, as long as they are valuable, rare, and difficult to imitate and to substitute. This description rather precisely most of companies' intangible resources.

Different from studies that focus on how external factors affect company performance and that explain poorly the different levels of performance within the same industry (KUMLU, 2014; VILLALONGA, 2004), several papers that follow RBV show evidence that intangible resources are the main drivers of firms' performance (BOJ; RODRIGUEZ-RODRIGUEZ; ALFARO-SAIZ, 2014; KUMAR, 2009; VOMBERG; HOMBURG; BORNEMANN, 2015). In this paper we examine the organization's internal resources by using the RBV approach, because the understanding of the role of strategic resources in generating a competitive advantage, started by Barney (1991), still remains as a research gap (CHADWICK; SUPER; KWON, 2015; MITRA; NEALE, 2014).

Intangible resources are difficult to measure and are particularly hard to be appropriated by firms, due to their immaterial, non-physical characteristics, and lack of an active market (AMADIEU; VIVIANI, 2010; CHEN; DANBOLT; HOLLAND, 2014). However, intangible resources are necessary attributes for firms to establish a sustainable competitive advantage (BARNEY, 1991). As a consequence, these resources are of great interest to

managers and researchers. Their relevance is also highlighted by the fact that, due to restrictive accounting rules, most intangibles generated within the company are not accounted for in the company's financial statements, resulting in a salient difference between market value and book value of publicly traded companies' net assets. This suggests that a relevant part of the companies' market value refers to their intangible resources (LEV, 2005).

Due to the expected influence of intangible resources on organizational performance, Ang and Wight (2009), Frank and Obloj (2014) and Krause, Semadeni and Withers (2016) explored the relationship between one type of intangible asset/resource (corporate reputation, human capital) and organizational performance. However, there are four important shortcomings that limit the outreach of these contributions to theory: (a) they disregard the synergy between intangible assets by not focusing on a set of resources as drivers of organizational performance (BRAHIM; ARAB, 2011; KAMASAK, 2017); (b) they concentrate on case studies, relegating quantitative research to the background, which would contemplate more than one organization as unit of analysis, as well as longitudinal data (CHEN; DANBOLT; HOLLAND, 2014; YING; HASSAN; AHMAD, 2019); (c) they do not explore how intangible resources add value (ZIGAN, 2013); and d) they lack a multidisciplinary theoretical and methodological approach that takes into account scholars' assumptions from different areas of knowledge (MOLLOY *et al.*, 2011). These limitations inhibit a better understanding of the relationship between intangible resources and organizational performance, as RBV states, consisting on an important research gap that this paper addresses.

Vomberg, Homburg and Bornemann (2015) worked with one feature of this gap, by considering intangible resources, like brand and human capital, and their complementarity and causal ambiguity in the process of creating higher firm performance. The authors report evidence of a direct relationship between brand and firm value (gauged by Tobin's Q), unlike the results for human capital. However, there are important limitations in the authors' work, such as the use of market surveys' ratings as proxies for organizations' human capital and brand values – these ratings are highly dependent on organizations' financial performance (DAVIES *et al.*, 2001) - and of accounting and financial measures to represent the organization's performance (Tobin's Q and Cash Flow), instead of their market value.

In this context, our research problem is inserted, which consists in measuring the impact of investments in intangible resources on business performance, contributing to the understanding of the relationship between these elements. In addition to addressing the following theoretical gaps: (a) to consider the synergy between intangible assets, using a set of resources as drivers of organizational performance; (b) to use quantitative data, a set of companies as unit of analysis and longitudinal data; and (c) to explore how intangible resources add value; the proposed methodological design seeks to overcome the limitations present in the study by Vomberg, Homburg and Bornemann (2015), by using objective data such as proxies to intangible resources value and market metrics focused on value as proxies of organizational performance, in addition to accounting indicators.

Banks were chosen as the unit of analysis for several reasons: (a) they are knowledge-intensive (CHAHAL; BAKSHI, 2015; RADULOVICH; JAVALGI; SCHERER, 2018); (b) they operate in a business segment where information on intangible resources' investments is available; and (c) they are the object of several studies that address the relationship between intangible assets/resources and organizational performance (CHEN; DANBOLT; HOLLAND, 2014; RODRÍGUEZ; MACAGNAN, 2016). Thus, the results of this study open new paths for research, considering companies operating in other intellectually intensive segments, which continually invest in intangible resources.

We contribute to the understanding of the relationship between intangible resources and performance by proposing the use of some measures as proxies of intangible resources' value. We incorporated the suggestions of RBV literature on the operationalization of intangible resources, including: a) the analysis of different intangible resources (BRAHIM; ARAB, 2011; KAMASAK, 2017), and b) to take into account longitudinal data and a sample of companies in a quantitative research (CHEN; DANBOLT; HOLLAND, 2014; KAMASAK, 2017; ZIGAN, 2013).

Our results show that investment in multiple categories of intangible resources positively affected the performance of the Banks within our sample, resulting on increased market-based performance measures, such as market values, abnormal returns, Tobin's Q. Individually, investments on Human Intangible Resources (HR) and on Structural or Organizational Intangible Resources (SR) were the investments associated with higher

performance increases. We also show that the return to investments on HR are larger for larger Banks which have nationwide operations.

2 HYPOTHESES

The extant strategic management literature focuses on identifying why some organizations have better performance than others (COSTA; COOL; DIERICKX, 2013; CROOK *et al.*, 2008). RBV, a widespread approach on strategic management research, assumes that the possession of strategic resources is the reason (BARNEY, 1991). By understanding that intangible resources are firm strategic resources - rare, valuable and difficult to imitate and replace - this study investigates the relationship between intangible assets and organizational performance (BOJ; RODRIGUEZ-RODRIGUEZ; ALFARO-SAIZ, 2014; LOW; LEE, 2014; VOMBERG; HOMBURG; BORNEMANN, 2015).

Hall (1993) ranks intangible resources as assets or competencies. He also proposes a classification based on some attributes: a) capacities that shape the organization's ownership, such as patents, and those that include the competence to develop a certain activity, like know-how; (b) intangible assets that are people-dependent, such as corporate reputation, and intangible assets that are independent of people, like databases; and c) intangible assets that legislation can protect, such as trademark, and those that it cannot, like organizational networks.

Fernández, Montes and Vásquez (2000) consider intangible resources as basically made of information and knowledge. They built an intangible resources' typology, from the categorization developed by Hall (1993). The typology proposed by Fernández, Montes and Vásquez (2000) considers four categories of intangible resources: human, organizational, technological and relational, each with several components. They also present the appropriation mechanisms of these resources, given the difficulty to measure and appropriate their value. We choose to focus on human, organizational and relational intangibles resources, due to the fact that Banks make significant investments in these types of resources (strategic resources). Technological resources such as patents, commercial secrets, industrial designs and copyright, which for instance are recognized as strategic resources for the pharmaceutical industry (AMADIEU; VIVIANI, 2010), are not a differentiating factor for Brazilian Banks.

We consider that the investments in intangible resources drive to a higher performance (BARNEY, 1991). Given the difficulty to measure the individual impact of the investment in different categories of intangible resources individually, we propose our Hypothesis 1 by considering that the sum of investments in intangible resources affects organizational performance positively:

H_1: The higher the investment in intangible resources (HR, SR and RR), the higher the organizational performance.

Considering theoretical assumptions on the relationship between human intangible resources and organizational performance, we propose that knowledge acquired by an employee increases their productivity, professional capacity and the value of their contribution to the organization. The accumulation of knowledge of an individual is usually called know-how, which can be tacit or explicit (FERNÁNDEZ; MONTES; VÁSQUEZ, 2000).

Employees' know-how and managers' superior skills can result in a unique competence that distinguishes one organization from others, especially among service providers such as banks (DATTA; ISKANDAR-DATTA, 2014; KRAUSE; SEMADENI; WHITERS, 2016). Employees' individual skills are a source of competitive advantage for organizations, which can develop and improve them through training and capacity building (MILLER; XU; MEHROTRA, 2015).

Human Intangible Resources (HR) are those that affect organizational performance the most, directly or indirectly, and are the most enduring (HALL, 1992; HALL 1993; SAKALAS; LIEPE, 2010; MILLER; XU; MEHROTRA, 2015; VOMBERG; HOMBURG; BORNEMANN, 2015; STARR; GANCO; CAMPBELL, 2018). Strategic management, which is an area of knowledge that seeks to explain the heterogeneity in organizations' performance, considers human capital a key element of success (GAMBARDELLA; PANICO; VALENTINI, 2015). When the organization has Human Resource Management (HRM) practices that are conscientious, diligent and fair, the employees reciprocate with positive attitudes, resulting in superior performance (LU *et al.*, 2015). In the same way, Bendickson and Chandler (2019) found out that Better Human Capital Development Programs (HCDP) provide competitive advantage that positively affects operational performance and financial outcomes of the organizations.

Therefore, we propose Hypothesis H1a in the following form:

H_{1a}: The higher the investment in human intangible resources, the higher the organizational performance.

The structural assets of an organization include norms, procedures, databases, routines and organizational culture, among others. A strong organizational culture has a high standard of quality and the ability to react to challenges, change and learn continuously, thus providing the company with a competitive advantage (HALL, 1993).

Structural resources also relate to the information and knowledge that companies hold, and can provide a competitive advantage (HALL, 1993; FERNÁNDEZ; MONTES, VÁSQUEZ, 2000). Considering banks' context, to have a wide database and to develop an effective system for credit risk analysis are sources of competitive advantage.

As banks compete in a knowledge-based economy, the development of an efficient (internal and external) technological communication - virtual platforms, internet banking, applications - is also a competitive differential, because financial resources become available around the world, instantly (TSAI; LU; YEN, 2012). The implementation of internet banking, for example, is a complex and knowledge-intensive task, since the value of the tangible resources involved is minimal, compared to the knowledge value for this activity (WEIGELT; MILLER, 2013).

Companies that provide services are those that invest in information technology the most, and among them banks have the highest investment index, since their products and services depend directly on the use of information systems (FACÓ; CSILAG, 2010).

Considering that the investments in structural or organizational intangible resources can generate strategic resources and positively affect the performance of organizations, we proposed Hypothesis H_{1b}:

H_{1b}: The higher the investment in structural or organizational intangible resources, the higher the organizational performance.

Relational resources are key factors for companies' success, especially for those operating in the capital market, where market defines their value. Relational intangible resources comprise corporate reputation, brand, customers' loyalty, distribution channels,

and long-term relationships with strategic stakeholders, and are the relational capital of an organization, which involves mutual trust, respect and friendship that arise from the interaction between partners (FERNÁNDEZ; MONTES, VÁSQUEZ, 2000; KOHTAMAKI *et al.*, 2012).

Brown and Perry (1994) examined several studies that proved the relationship between corporate reputation (one of the main intangible resources) and organizational performance. Carmeli and Tischler (2005) observed the existence of this relationship by using the following performance measures: a) growth; b) profitability; (c) financial soundness; d) market share; and e) sales estimates.

Liu *et al.* (2014) examined relational intangible resources in social media and identified that company's reputation – an attribute that has a direct relationship with the level of exposure in media and social networks - has a positive impact on organizational performance. Vomberg, Homburg and Bornemann (2015), in turn, analyzed the relationship between brand, human capital and performance, and concluded that a strong brand encourages employees to use their know-how, thus affecting positively customers' loyalty and the cost of change.

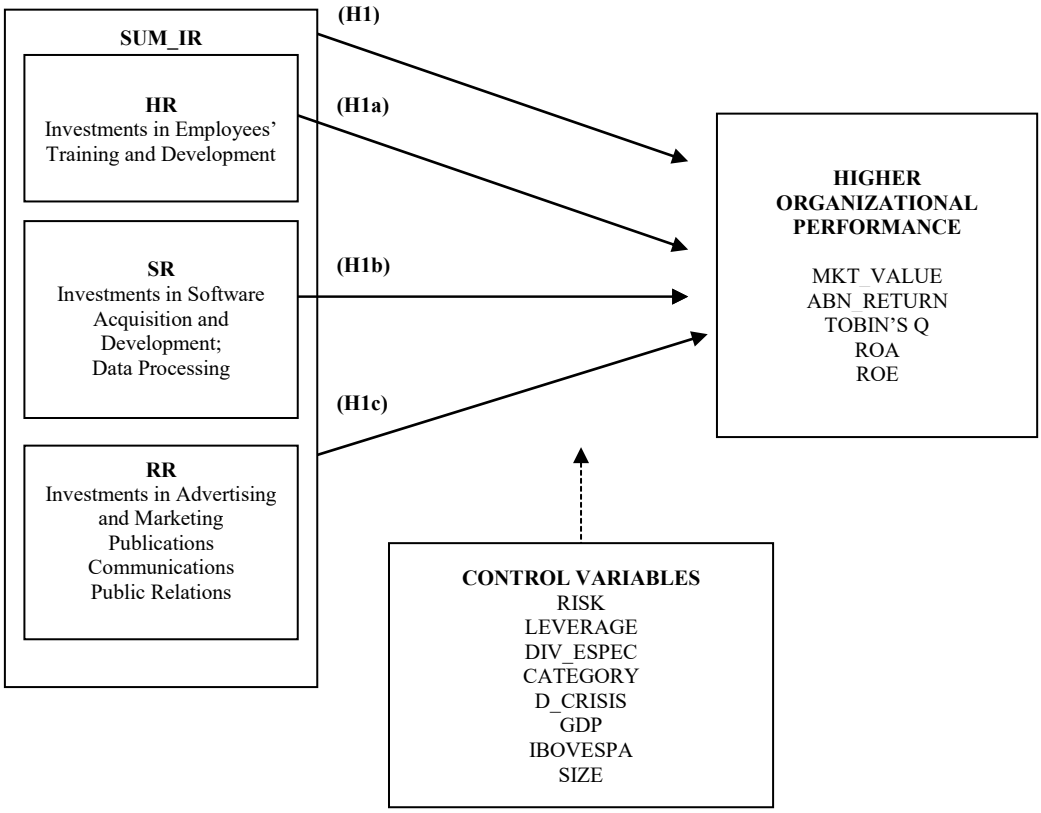
Considering the studies above-mentioned, we assume that investments in relational intangible resources can generate strategic resources and positively affect the performance of organizations. Thus, we proposed Hypothesis H_{1c}:

H_{1c}: The higher the investment in relational intangible resources, the higher the organizational performance.

Our hypotheses focus on the understanding of the relationship between intangible resources and performance, given our choice on performance measures as proxies of the value created by investment in intangible resources. In that sense, we incorporated the suggestions of the RBV literature on the operationalization of intangible resources, including the analysis of different intangible resources (BRAHIM; ARAB, 2011; KAMASAK, 2017), and taking into account longitudinal data and a sample of companies in a quantitative research (CHEN; DANBOLT; HOLLAND, 2014; KAMASAK, 2017; ZIGAN, 2013).

Considering the complexity for measuring the value of intangible resources, we used the values of their investments in Brazilian banks as proxies and relate them to indicators of organizational performance, in order to understand how investments in intangible assets affect organizations' performance. We used some traditional control variables as moderators of this relationship. Figure 1 shows the main elements of this study and the research hypotheses that have been tested.

Figure 1 - Theoretical Model



Source: Elaborated by the authors, 2020.

In discussing the theoretical gap that led to this research, it is important to remember that studies by Ang and Wight (2009), Frank and Obloj (2014), and Krause, Semadeni and Withers (2016) explored the relationship between one category of intangible asset (such as corporate reputation, human capital and others) and organizational performance. Due to the lack of secondary information about the investments and the value of intangible resources, as well as scholars' trend to carry out case studies on this subject (ZIGAN, 2013), prior studies usually address only one intangible resource as determinant of organizational performance. The phenomenon of causal ambiguity limits these case studies, by recognizing the difficulty to

measure the value of a single intangible resource and its contribution to competitive advantage and, consequently, to a specific performance (FERNÁNDEZ; MONTES, VÁSQUEZ, 2000; VOMBERG; HOMBURG; BORNEMANN, 2015).

3 RESEARCH DESIGN

This section presents the procedures used in data analysis and is subdivided into: sample, models and data collection.

3.1 SAMPLE

We studied 19 Brazilian banks listed in B3 (the Brazilian Commodities, Futures and Stocks' Exchange). In terms of total assets, the sample includes four of the five largest Brazilian banks, and altogether, the banks in the sample represent approximately 67% of the Brazilian banking market (FEBRABAN, 2016).

We did not include some banks listed in B3 in our sample due to the following reasons: (a) they are holding companies, such as Consórcio Alfa de Administração and Itausa Investimentos S.A.); (b) a bank that is part of the sample (Banco do Brasil) has control over the institution (Banco Patagônia S.A.); (c) a bank with a large number of missing data regarding investments in intangible resources (Banco BTG Pactual S.A.); (d) a bank that became a private company in 2015 (Banco Industrial e Comercial S.A.); and (e) a bank which is not comparable to the rest of the samples, not fitting into any of the categories within the sample (Banco Mercantil S.A.). These categories are: National Retail Banks, Regional Retail Banks and Niche Banks. As Banco Mercantil operates in retail, but has a smaller market share than other National Retail Banks and has private control, differently of regional retail banks, it did not fit into any category. Lastly, the Caixa Econômica Federal, the 3rd largest bank in Brazil is not a publicly traded company, and is therefore not included in the sample. Table 1 describes the banks in the sample, including the control type, operation form and the number of branches.

Table 1 – Research sample

Companies	Control	Operation	Number of Branches
Banco ABC Brasil S.A.	Private National with foreign control	Niche	5
Banco Alfa de Investimento S.A.	Private National	Niche	9
Banco Amazônia S.A.	Public, Federal control	Regional Retail	124
Banco Bradesco S.A.	Private National	National Retail	4.478
Banco de Brasília S.A.	Public, State control	Regional Retail	121
Banco Daycoval S.A.	Private National	Niche	38
Banco do Brasil S.A.	Public, Federal control	National Retail	5.428
Banco do Estado do Espírito Santo S.A.	Public, State control	Regional Retail	132
Banco do Estado do Pará S.A.	Public, State control	Regional Retail	104
Banco do Estado do Rio Grande do Sul S.A.	Public, State control	Regional Retail	536
Banco do Estado do Sergipe S.A.	Public, State control	Regional Retail	63
Banco Indusval S.A.	Private National	Niche	6
Banco Itaú Unibanco S.A.	Private National	National Retail	3.575
Banco Nordeste do Brasil S.A.	Public, Federal control	Regional Retail	319
Banco Panamericano S.A.	Private National	Niche	2
Banco Pine S.A.	Private National	Niche	7
Banco Santander S.A.	Private National with foreign control	National Retail	2.655
Banco Sofisa S.A.	Private National	Niche	14
Paraná Banco S.A.	Private National	Niche	1

Source: Adapted from Banco Central do Brasil (2016).

National Retail Banks comprise 21% of the sample, and adopt dispersion strategies and economies of scale, hence having the largest number of branches. Regional Retail Banks represent 37% of the sample, are controlled by their States or by the Brazilian Federal Government, and in general have a smaller number of branches than National Retail Banks. Niche Banks are 42% of the sample, have private control and, given their strategies of selective concentration and economies of scope, have a smaller number of branches.

Banks in our sample provided information on investments in intangible resources that appear in their financial statements and quarterly reports, from the first quarter of 2008 to the fourth quarter of 2015. Data about investments in intangible resources were hand-collected in the notes to these banks' financial statements.

3.2 MODELS

Consistent with our research hypotheses, our econometric models have the objective of identifying the relation between banks' investment multiple dimensions of intangible assets and increased performance, proxied by increased market value, return on assets and return on equity. Therefore, our model can be generalized in the form of Equation 1:

$$\Delta Performance_{i,t} = \beta_0 + \beta_1 Investment\ on\ Intangibles_{i,t-1} + \beta_2 Risk_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 DivEsp_{i,t} + \beta_5 Category_{i,t} + \beta_6 Crisis_{i,t} + \beta_7 \Delta GDP_{i,t} + \beta_8 \Delta IBOV_{i,t} + \beta_9 Size_{i,t} + \varepsilon \quad (1)$$

The $\Delta Performance_{i,t}$ was measured as the change of performance measure observed from period t -1 to period t. Considering that a wide range of studies that evaluate the relationship between strategic resources and organizational performance use Tobin's Q and ROA as performance measures (BROMILEY; RAU, 2014), we used them as performance measures. We have also included Market Value, Abnormal Returns and ROE as an alternative performance measure, ending with a set of five variables considering market data alone (MKT_VALUE and ABN_RETURN), accounting and market data together (TOBIN_Q), and pure accounting indicators (ROA and ROE).

When we estimate our models considering the change in MKT_VALUE, change in TOBIN_Q and ABN_RETURN as dependent variables, we also control for contemporary changes on the bank's ROE. By controlling for changes in ROE, which is a current measure of accounting return, we try to decouple short-term increases in performance (which are measured by change in ROE) from long-term increases, which are proxied by our market-based performance measures.

Regarding the variable of interest, $Investment\ on\ Intangibles$, we measure it in four different ways, in order to consider the multiple dimensions of intangible assets considered

by the extant literature. We consider the classification provided by Fernández, Montes and Vásquez (2000): HR (Human Intangible Resources), SR (Structural or Organizational Intangible Resources), RR (Relational Intangible Resources), and complement these categories with the variable SUM_IR, which represents the sum of Human, Structural or Organizational and Relational Intangible Resources. HR comprise investments in Employees' Training and Development; SR involve investments in Software Acquisition, Software Development and Data Processing; and RR include investments in Advertising, Marketing, Communications, Public Relations and Publications. These investment variables are scaled by the Bank market capitalization, in order to mitigate the impact of the size of the investment relative to the size of the bank.

We expect the impact of investments in intangible resources on organizational performance to appear only sometime after the investment has been made. We derive this expectation from the fact that investments take some time to mature and to be translated into economic effects. Gujarati and Porter (2011) present the role of lag in models that contemplate economic data, describing that dependence on an explanatory variable over independent variables is rarely immediate. Often, Y responds to X with time lapses (lags). Wooldridge (2012) discussed an econometric model whose objective was to analyze the impact of investment in employees' training and development on product scrap rates, and used a minimum lag of one year for the variable of interest, named "training & development". Thus, to examine this effect on the estimates, we considered a gap (lagged effect) of four quarters for each of the variables of interest, since this would be the minimum time required for the investment in an intangible resource to generate strategic resources and, therefore, to affect banks' performance.

Our control variables include accounting and market variables that can affect the performance of organizations, based on the extant literature. These are: Risk (Volatility of Share Value), Leverage (Basel Index), Size (Total Assets), Degree of Diversification *versus* Specialization (DIV_ESPEC), Category, which considers the type of control and mode of operation of banks (RETAIL_N, RETAIL_R), the impact of the Subprime Crisis in the years of 2008 and 2009 (D_CRISIS) and two variables that measure economic and market performance: Brazil's GDP (GDP) and Ibovespa Index (IBOVESPA).

Macedo, Santos and Silva (2006) and Macedo and Barbosa (2009) used classifications from the literature to rank banks that operate in Brazil: a) wholesale; b) retail; c) financing; and d) middle market. We chose to categorize the banks of wholesale, financing and middle market as Niche's Banks (B_NICHE) and split the Retail Banks in National Market (RETAIL_N) and Regional Banks (RETAIL_R). The Category variable on Eq. (1) is a representation of dummy variables RETAIL_N (National Retail Banks), RETAIL_R (Regional Retail Banks) which classify the banks by considering attributes such as scope (national or regional) and mode of operation (retail or niche). Niche banks that are not on regional or regional retail form the baseline category.

Table 2 – Control variables

Variables		Description
RISK		Standard deviation of share value
LEVERAGE		Basel Capital Index (BRAZILIAN ASSOCIATION OF FINANCIAL AND CAPITAL MARKET ENTITIES, 2015)
DIV_SPEC		*Herfindahl Hirschman Inde*x (MERCIECA; SCHAECK; WOLFE, 2007; SANYA; WOLFE, 2011; STIROH; RUMBLE, 2006)
CATEGORY	RETAIL_N	*Dummy* named *RETAIL_N1,* with value 1 for National Retail Banks and zero otherwise
	RETAIL_R	*Dummy* named *RETAIL_N2,* with value 1 for Regional Retail Banks and zero otherwise
D_CRISIS		*Dummy* named *D_CRISIS,* with value 1 for the years 2008 and 2009 and zero otherwise, in order to control the effects of the Subprime crisis
GDP		Variation of Brazil's GDP
IBOVESPA		Variation of Ibovespa Index
SIZE		Logarithm of total value of assets

Source: Elaborated by the authors, 2020.

3.3 DATA COLLECTION

We collected information on the investments in intangible resources through: a) managerial reports; b) standardized financial statements; and c) explanatory notes from the sampled banks. We gathered information from Economática® database regarding market value and accounting variables in general for the calculation of accounting and market indicators that make up the dependent and control variables (ROA, ROE, Tobin's Q, Size, etc.).

We obtained information on the share value of banks at B3 and data registered at Brazil Central Bank (BCB), which included number of branches, type of control and segment

of operation. As theoretical discussion suggests a dependence relationship between organizational performance and investments in intangible resources, we chose the statistical technique of multiple linear regression for data processing (HAIR JR. *et al.*, 2009). Because we examined operations over eight years, we estimated data in a panel format, using the R programming language (R CORE TEAM, 2019) and STATA 15 (STATACORP, 2017).

The use of panel data assumes the existence of cross-sectional effects (companies) and time effects on the data. We checked for cross-sectional effects through the Lagrange Multiplier (LM) test (BREUSCH; PAGAN, 1980). For models with fixed effects, we conducted the F Test for Individual Effects, which has as Null Hypothesis (H_0) the absence of significant effects, and as Alternative Hypothesis (H_1) the presence of significant effects. Finally, we choose between fixed and random effects models considering the results of the Hausman Test. Our standard errors are clustered at the firm level and robust for heteroscedasticity.

4 RESULTS

Our final sample of 422 bank-year observation has 18 unique banks, with number of observations ranging from 13 to 28 quarters, due to the fact that some banks enter the sample at a later period of time, when they have their respective IPO. 177 bank-year observation belong to the Niche category, 109 to the Retail Banks in National Market category and 136 are regional Banks.

Untabulated results from Pearson and Spearman correlations between this papers' variables show no correlation between pairs of variables above 0.6, suggesting that there are no extreme problems of collinearity on our data. Since some variables are not normally distributed, the Spearman rank correlation, being a non-parametric correlation measure, provides better information on our data correlation structure.

In Table 3, we present the parameters estimated based on Eq. 1, measuring the effect of the total amount invested by banks on intangibles on our dependent variables, change in MKT_VALUE, change in TOBIN_Q, ABN_RETURN, change in ROE and change in ROA. With the exception of change in ROA, for which there were no panel effects, the estimation was conducted with fixed effects structure, controlling then for unobserved heterogeneity among banks in our sample, including characteristics that are invariant in time. The total investment

in intangibles (SUM_IR) was significantly related to an increase on MKT_VALUE, ABN_RETURN and TOBIN_Q, which suggests that the markets react positively to investment in intangibles. The positive and significantly relationship between SUM_IR and performance corroborates the results obtained by Vomberg, Homburg and Bornemann (2015) and Kamasak (2017) and supports Hypothesis H1.

An increase of one unit of the variable SUM_IR, which represents the total investment in intangible resources scaled by the bank's market capitalization, leads to an increase of 2.61% in market capitalization in the four quarters after the investment, an economically significant percentage. The same positive signal is observed regarding the response of ABN_RETURN (1.07489%) and TOBIN_Q (2.21853%) to increases of one unit in SUM_IR. Regarding accounting returns, our estimation shows no significant response of ROE to SUM_IR, and a negative and significant relation between ROA and SUM_IR, which might suggest that in the short term, investments in intangibles are associated with lower accounting earnings. Nonetheless, that negative effect appears to be compensated by positive capital market effects, which theoretically capture long-term economic benefits derived from the investment.

Table 3 – Models estimating the effect of total investment in intangibles on our dependent variables

	MKT_VALUE – FE	ABN_RETURN- FE	TOBINS_Q – FE	ROE – Pooled	ROA – FE
Δ ROE	-0.00990	0.02675^{+}	0.02262		
	(0.02709)	(0.01327)	(0.02580)		
SUM_IR	**2.61679****	**1.07489***	**2.21853*****	-2.04578	**-4.00793***
	(0.69913)	(0.38901)	(0.34550)	(1.28695)	(1.63633)
RISK	0.01653	0.05212	-0.00572	-0.08813	0.01718
	(0.07308)	(0.04721)	(0.02896)	(0.06545)	(0.06474)
LEVERAGE	0.18880	0.09178^{+}	0.03564	0.27074	0.33831
	(0.13833)	(0.04753)	(0.06437)	(0.17323)	(0.24215)
DIV_ESPEC	0.01927	-0.02518	0.10058	-0.20103	-0.06797
	(0.05353)	(0.03106)	(0.05863)	(0.12812)	(0.16362)
RETAIL_N				0.34338	
				(0.23447)	
RETAIL_R				0.24828*	
				(0.09603)	
D_CRISIS	0.06081	0.02776	0.11150	-0.14726^{+}	-0.19517
	(0.10051)	(0.03060)	(0.08042)	(0.08230)	(0.18888)
Δ GDP	0.63080*	0.21381^{+}	0.88214**	0.15744	-0.07130
	(0.23276)	(0.11992)	(0.23471)	(0.30966)	(0.46405)
Δ IBOVESPA	0.70942***	-0.18575***	0.30069**	0.33829^{+}	0.40728*
	(0.11534)	(0.04683)	(0.09660)	(0.17772)	(0.15481)
SIZE_A	-0.22104^{+}	-0.06760^{+}	0.04299	-0.02894	0.01925
	(0.10619)	(0.03686)	(0.07022)	(0.05114)	(0.19378)
CONSTANT	3.96577*	1.21027^{+}	-0.79689	0.79849	0.32736
	(1.87359)	(0.57969)	(1.27899)	(0.69478)	(3.32131)

	MKT_VALUE – FE	ABN_RETURN- FE	TOBINS_Q – FE	ROE – Pooled	ROA – FE
AIC	0.02016	-5.03e+02	-1.87e+02	611.58770	575.26805
BIC	36.42521	-4.67e+02	-1.51e+02	656.08276	607.62810
r2	0.443	0.122	0.325	0.074	0.081
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

In Table 4, we estimate Eq.1 with a decomposition of SUM_IR into its components, HR, SR and RR. Results show that HR does not have a statistically significant association with capital market effects or accounting returns in our sample, which contradicts the results obtained by Miller, Xu and Mehrotra (2015) and Krause, Semadeni and Withers (2016).

Investments on SR are positively related with capital market effects, driving the majority of the results already observed in Table 3 regarding MKT_VALUE and ABN_RETURN, with coefficients slightly larger than the effect of SUM_IR on these variables. Investments on RR explain part of the effect of SUM_IR on change on TOBIN_Q (coefficient of 4.01070), alongside with SR (coefficient of 1.64882). Table 4 also shows how investments on RR are negatively related with accounting return variables (ROE and ROA), suggesting that this kind of investment has on average negative effects on short-term earnings, which is not counterbalanced directly by a contemporaneous inverse effect on capital market variables.

In summary, results in Table 4 suggest that the markets are not particularly sensitive to investments on HR and RR, but respond in an economically significant way to investments on SR. The results obtained for SR support hypothesis H1b and contradict the expectation that banks do large investments in structural resources systematically, offering less room for differentiation (FACÓ; CSILLAG, 2010). Possibly, the results obtained reflect the changes in the Brazilian banking scenario in the last decade, in which competition increased significantly between well-established banks, and was also affected by the entrance of some fintechs in the market. The Financial Stability Report issued by the Brazilian Central Bank (BCB) highlights that the emergence of business models based on innovative technologies, such as fintechs, have influenced the volume of information technology investments in the Brazilian Financial System, fostering an accelerated process of digital transformation in the banks (BCB, 2019).

Table 4 – Models estimating the effect investment in intangibles by category on our dependent variables

	MKT_VALUE – FE	ABN_RETURN-FE	TOBINS_Q – FE	ROE – FE	ROA – FE
Δ ROE	-0.01438	0.02128	0.02820		
	(0.02923)	(0.01404)	(0.02688)		
HR	9.87689	4.61025	2.02207	7.34376	9.29026
	(6.79868)	(4.22440)	(4.96343)	(8.50695)	(9.69305)
SR	**2.70379*****	**1.45895****	**1.64882*****	-2.15057	-2.02720
	(0.58419)	**(0.39452)**	**(0.31692)**	(1.54446)	(1.57763)
RR	1.74539	-0.41463^{+}	**4.01070*****	**-10.23903*****	**-10.86857*****
	(1.86710)	(0.20891)	**(0.46591)**	**(1.19382)**	**(1.03124)**
RISK	0.02094	0.05389	-0.00523	0.00642	0.02330
	(0.06186)	(0.04357)	(0.02823)	(0.06581)	(0.06657)
LEVERAGE	0.18958	0.09662^{+}	0.02821	0.17801	0.35830
	(0.14679)	(0.04623)	(0.06590)	(0.24838)	(0.23625)
DIV_ESPEC	0.00894	-0.04213	0.12065*	-0.20074	-0.14364
	(0.04358)	(0.02518)	(0.05318)	(0.17733)	(0.17805)
D_CRISIS	0.05682	0.03033	0.10412	-0.22309	-0.17364
	(0.10033)	(0.03360)	(0.07639)	(0.18286)	(0.19647)
Δ GDP	0.61056*	0.22838^{+}	0.84212**	-0.11496	0.02019
	(0.21617)	(0.11896)	(0.23557)	(0.48593)	(0.48861)
Δ IBOVESPA	0.70923***	-0.19103***	0.30931**	0.37195^{+}	0.37072*
	(0.11232)	(0.04640)	(0.09869)	(0.18636)	(0.15902)
SIZE_A	-0.23017*	-0.07628*	0.05027	-0.15405	-0.01569
	(0.10189)	(0.03378)	(0.06327)	(0.20452)	(0.20234)
CONSTANT	4.10868*	1.35077*	-0.91850	2.97850	0.88366
	(1.82812)	(0.55129)	(1.17231)	(3.50825)	(3.48469)
AIC	0.94463	-5.06e+02	-1.87e+02	563.41977	567.73265
BIC	45.43969	-4.62e+02	-1.43e+02	603.86982	608.18270
r2	0.447	0.137	0.332	0.095	0.106
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

As a robustness test, considering the expected correlation between investments in HR, SR and RR and the individual effects of those variables could depend on each other, we present in Tables 5 to 7, estimations of Eq.1 with one variable of interest per time. Our results show no statistically significant effects for investments on HR (Table 5), a positive and significant relation for the investment in SR (Table 6) with capital market-related variables (MKT_VALUE, ABN_RETURN and TOBIN_Q), and a negative relation between RR (Table 7) and accounting returns (ROE and ROA). Results presented in Table 5 to 7 are aligned with those reported in Table 4 in terms of statistical and economical significance.

Table 5 – Models estimating the effect investment in intangibles HR on our dependent variables

	MKT_VALUE – FE	ABN_RETURN-FE	TOBINS_Q – FE	ROE-Pooled	ROA – Pooled
Δ ROE	-0.03632	0.01588	0.00085		
	(0.02976)	(0.01567)	(0.03420)		
HR	10.82563	4.64029	3.64735	0.72970	0.33900
	(6.79111)	(4.23015)	(4.21205)	(6.95695)	(7.76167)
RISK	0.02002	0.05368	-0.00639	-0.01292	0.00733
	(0.06173)	(0.04361)	(0.02916)	(0.05412)	(0.04898)
LEVERAGE	0.14385	0.07332	-0.00267	0.29187	0.30736^{+}

	MKT_VALUE – FE	ABN_RETURN-FE	TOBINS_Q – FE	ROE-Pooled	ROA – Pooled
	(0.16479)	(0.06381)	(0.07383)	(0.17144)	(0.16445)
DIV_ESPEC	-0.00652	-0.03580	0.07935	-0.16017	-0.11028
	(0.04839)	(0.02637)	(0.07445)	(0.13288)	(0.12545)
RETAIL_N				0.19357	0.20037
				(0.20226)	(0.21636)
RETAIL_R				0.13235	0.13962^{+}
				(0.07909)	(0.06784)
D_CRISIS	0.01716	0.00970	0.07826	-0.09697	-0.13493
	(0.10744)	(0.03372)	(0.07625)	(0.08086)	(0.08527)
Δ GDP	0.46090^{+}	0.14324	0.76038**	0.29776	0.15369
	(0.22569)	(0.11265)	(0.23720)	(0.29990)	(0.23709)
Δ IBOVESPA	0.75348***	-0.16762**	0.33733**	0.29725	0.34309*
	(0.11274)	(0.04519)	(0.09454)	(0.17632)	(0.15190)
SIZE_A	-0.22089^{+}	-0.06772^{+}	0.04820	-0.00825	-0.00640
	(0.10724)	(0.03394)	(0.07148)	(0.04603)	(0.05233)
CONSTANT	3.96217^{+}	1.21148*	-0.87703	0.44151	0.43037
	(1.98961)	(0.55132)	(1.27895)	(0.61719)	(0.69648)
AIC	20.39767	-4.92e+02	-1.59e+02	618.76268	621.53758
BIC	56.80272	-4.55e+02	-1.23e+02	663.25773	666.03263
r2	0.416	0.099	0.279	0.059	0.061
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

Table 6 – Models estimating the effect investment in intangibles SR on our dependent variables

	MKT_VALUE - FE	ABN_RETURN- FE	TOBINS_Q - FE	ROE-Pooled	ROA – FE
Δ ROE	-0.02062	0.02364^{+}	0.01126		
	(0.02729)	(0.01279)	(0.02984)		
SR	**2.87067*****	**1.43578*****	**1.98333*****	-0.71361	-3.04745^{+}
	(0.57140)	**(0.35583)**	**(0.29722)**	(1.03783)	(1.66892)
RISK	0.01374	0.05104	-0.00821	-0.03610	0.02200
	(0.07709)	(0.04872)	(0.02765)	(0.06321)	(0.06033)
LEVERAGE	0.19015	0.09651*	0.02946	0.28526	0.36371
	(0.13371)	(0.04530)	(0.05865)	(0.17472)	(0.25051)
DIV_ESPEC	-0.00896	-0.03711	0.07723	-0.16832	-0.02875
	(0.04456)	(0.02648)	(0.07187)	(0.12924)	(0.15667)
RETAIL_N				0.24708	
				(0.23452)	
RETAIL_R				0.16979^{+}	
				(0.08917)	
D_CRISIS	0.06535	0.03328	0.10894	-0.11324	-0.18748
	(0.10114)	(0.03265)	(0.08346)	(0.08229)	(0.18713)
Δ GDP	0.66801*	0.24371^{+}	0.88803**	0.24964	-0.05171
	(0.23127)	(0.12227)	(0.24065)	(0.31880)	(0.45636)
Δ IBOVESPA	0.70578***	-0.19138***	0.30487**	0.31209	0.39932*
	(0.11445)	(0.04640)	(0.09735)	(0.18434)	(0.16182)
SIZE_A	-0.22597^{+}	-0.07097^{+}	0.04117	-0.01553	0.01640
	(0.10843)	(0.03778)	(0.07494)	(0.05051)	(0.19236)
CONSTANT	4.05400*	1.26820*	-0.76018	0.56431	0.37187
	(1.91285)	(0.59747)	(1.34524)	(0.69046)	(3.30540)
AIC	4.76554	-5.06e+02	-1.74e+02	618.09646	585.45027
BIC	41.17058	-4.70e+02	-1.37e+02	662.59152	617.81031
r2	0.437	0.129	0.303	0.060	0.058
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

Table 7 – Models estimating the effect investment in intangibles RR on our dependent variables

	MKT_VALUE - FE	ABN_RETURN- FE	TOBINS_Q - FE	ROE - FE	ROA – FE
Δ ROE	-0.02160	0.01722	0.02284		
	(0.03054)	(0.01605)	(0.03078)		
RR	2.86837	0.17209	**4.58854*****	**-10.82742*****	**-11.36603*****
	(2.60590)	(0.50553)	**(0.88709)**	**(1.54757)**	**(1.21918)**
RISK	0.01417	0.05071	-0.00677	0.00203	0.01763
	(0.07661)	(0.04890)	(0.02897)	(0.06586)	(0.06947)
LEVERAGE	0.14641	0.07333	0.00192	0.21424	0.39255^{+}
	(0.15501)	(0.06253)	(0.07361)	(0.23299)	(0.22426)
DIV_ESPEC	0.02563	-0.03341	0.12922*	-0.20987	-0.15141
	(0.04514)	(0.02402)	(0.05580)	(0.17253)	(0.17306)
D_CRISIS	0.02547	0.01292	0.08224	-0.18945	-0.14041
	(0.10228)	(0.03197)	(0.07264)	(0.19393)	(0.20521)
Δ GDP	0.49114*	0.16114	0.75367**	0.03976	0.17531
	(0.23097)	(0.11534)	(0.23710)	(0.49520)	(0.49781)
ΔIBOVESPA	0.75120***	-0.16828**	0.33546**	0.33965^{+}	0.34014*
	(0.11315)	(0.04577)	(0.09622)	(0.18970)	(0.15876)
SIZE_A	-0.20435^{+}	-0.06306	0.06209	-0.16119	-0.02019
	(0.10971)	(0.03856)	(0.06256)	(0.21020)	(0.20776)
CONSTANT	3.69814^{+}	1.14003^{+}	-1.10887	3.10632	0.97041
	(1.99003)	(0.60709)	(1.15417)	(3.60018)	(3.57530)
AIC	20.79237	-4.88e+02	-1.80e+02	563.39713	567.75523
BIC	57.19742	-4.52e+02	-1.44e+02	595.75718	600.11527
r2	0.415	0.091	0.314	0.087	0.097
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

Finally, we estimate models that allow for an interactive effect between the investment in intangible resources and the category to which each bank belongs. This procedure allows for different sensibilities of capital markets' and accounting return's variables to investments on intangibles, depending on which category a Bank belongs to. These different sensibilities are plausible, given the fact that the underlying economics of these Banks can be significantly different depending on the category they are inserted into.

Results in Table 8 are similar to those reported in Table 3 (without interactions between SUM_IR and bank categories), with two relevant differences. The coefficients capturing the response of MKT_VALUE to investments on SUM_IR are still positive, for the baseline category and for RETAIL_N and RETAIL_R categories. Nonetheless, the standard errors are too large, and there is no statistical significance, probably due to the small number of banks in each category, constituting a limitation of this paper. Coefficients regarding dependent variables ABN_RETURN and ROE show a relevant difference between categories, as RETAIL_R banks have higher abnormal returns as response to SUM_IR than Niche Banks (the baseline category), and RETAIN_N banks have an even stronger response. Regarding ROE, RETAIL_R banks have a weaker reduction on ROE than Niche and RETAIL_N banks.

Table 8 – Models estimating the effect of total investment in intangibles on our dependent variables, allowing for differential effects per bank category

	MKT_VALUE- FE	ABN_RETURN - FE	TOBINS_Q - FE	ROE - FE	ROA – FE
Δ ROE	-0.01336	0.02209	0.02447		
	(0.02856)	(0.01393)	(0.02690)		
SUM_IR	1.96736	-0.53267	**3.27927*****	**-7.46848*****	**-7.21050****
	(1.86485)	(0.33364)	**(0.66058)**	**(0.83087)**	**(1.93910)**
SUM_IR* RETAIL_N	2.72858	**2.67212****	-0.47602	8.33709***	4.77194^{+}
	(2.00697)	**(0.86107)**	(1.09378)	(1.73531)	(2.56269)
SUM_IR* RETAIL_R	0.62282	**1.98949****	-1.45395^{+}	4.11217*	4.07371
	(1.86230)	**(0.50575)**	(0.73702)	(1.69321)	(2.46413)
RISK	0.01030	0.04618	-0.00479	-0.01742	0.00662
	(0.07257)	(0.04605)	(0.02836)	(0.06515)	(0.06868)
LEVERAGE	0.19208	0.08941*	0.04050	0.15849	0.33058
	(0.13903)	(0.04233)	(0.06410)	(0.24530)	(0.24219)
DIV_ESPEC	0.00987	-0.04666^{+}	0.11418^{+}	-0.17844	-0.10979
	(0.04667)	(0.02342)	(0.05670)	(0.17285)	(0.17275)
D_CRISIS	0.06129	0.03332	0.10646	-0.23087	-0.18119
	(0.10192)	(0.03386)	(0.07998)	(0.18097)	(0.19441)
Δ GDP	0.66243*	0.25163^{+}	0.86995**	-0.09272	0.00061
	(0.23014)	(0.11959)	(0.24775)	(0.46478)	(0.47728)
Δ IBOVESPA	0.70214***	-0.19210***	0.30120**	0.37956^{+}	0.39266*
	(0.11509)	(0.04450)	(0.09928)	(0.18408)	(0.15622)
SIZE_A	-0.23408*	-0.07653^{+}	0.04151	-0.15493	0.00584
	(0.10968)	(0.03947)	(0.06980)	(0.20454)	(0.20184)
CONSTANT	4.17960*	1.34241^{+}	-0.75885	2.97825	0.51232
	(1.94473)	(0.63712)	(1.27762)	(3.49548)	(3.45589)
AIC	2.06044	-5.09e+02	-1.86e+02	567.60936	576.08140
BIC	46.55550	-4.65e+02	-1.41e+02	608.05941	616.53145
r2	0.446	0.144	0.329	0.086	0.088
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

From table 9 to 11, results largely ratify results presented in Tables 5 to 7, without category differentiation and with some relevant and salient differential effects per category, as an example, the largest coefficient of SR on MKT_VALUE, from 2.87067 (Table 6) to 12.08419 (Table 10). However, there is one major difference once we account for differential effects per category, as shown in Table 9. Investment in HR is strongly significant, from a statistical and economic standpoint, when the bank belongs to the category RETAIL_N, whose result support hypothesis H1a and is align with the results obtained in related research (KRAUSE; SEMADENI; WHITERS, 2016; MILLER; XU; MEHROTRA, 2015).

In the case of these banks, which are significantly larger than Banks from the other categories, the return from investing on HR resources is very large, as the interaction term HR* RETAIL_N show that the average investment made by a National Retail Bank (RETAIL_N), representing 0,03313 % of its market capitalization, result in an increase of 0,0753% on its

market capitalization (0.03313 * 227.52, the coefficient of HR* RETAIL_N with respect to MKT_VALUE).

These results might be explained by the fact that investments in HR are not capitalized in the Bank's balance sheet, and it is not presented separately from other expenses in the income statements. The amount of the quarterly investment in HR is usually presented in a note to the financial statements. The fact that larger banks, such as the ones that are included in the RETAIL_N category, are more likely to attract increased coverage by investment analysts, who would have stronger incentives to analyze the notes to the financial statements in greater detail.

This assumption is consistent with data from I/B/E/S by Thomson Reuters, which shows that National Retail Banks (RETAIL_N) are the ones with the largest number of analysts following them. Further research could be conducted on the effects of analysts' coverage on the relation between investment in intangibles and capital market effects, as analysts may have an important role on processing information that is not salient in the Banks' financial statements, but it is presented along with a large amount of information in the firm's notes to their financial statements.

Table 9 – Models estimating the effect of total investment in intangibles on our dependent variables, allowing for differential effects per bank category

	MKT_VALUE- FE	BN_RETURN- FE	TOBINS_Q - FE	ROE - Pooled	ROA - FE
Δ ROE	-0.03622	0.01598	0.00079		
	(0.03013)	(0.01634)	(0.03374)		
HR	3.98460	-2.84100	7.88468	6.71134	7.64407
	(6.22193)	(0.47754)	(8.47754)	(12.59537)	(14.81141)
HR* RETAIL_N	**227.52815****	118.15300+	71.42662	27.60725	-1.07e+02
	(70.59254)	(59.67942)	(89.29651)	(124.03625)	(103.28334)
HR* RETAIL_R	11.08984	12.32773	-7.19404	-9.46945	-3.57312
	(12.69000)	(7.64681)	(9.26947)	(17.04262)	(20.70488)
RISK	0.01907	0.05393	-0.00790	-0.00506	0.02716
	(0.05593)	(0.03903)	(0.02865)	(0.05676)	(0.06351)
LEVERAGE	0.14193	0.06820	0.00344	0.29142	0.41682
	(0.17304)	(0.06294)	(0.06958)	(0.17268)	(0.24989)
DIV_ESPEC	-0.00370	-0.03408	0.07983	-0.16729	-0.03598
	(0.04859)	(0.02620)	(0.07445)	(0.14310)	(0.15526)
RETAIL_N				0.18534	
				(0.20726)	
RETAIL_R				0.15296	
				(0.09542)	
D_CRISIS	0.01762	0.01212	0.07486	-0.09597	-0.15038
	(0.11085)	(0.03693)	(0.07530)	(0.08175)	(0.20197)
Δ GDP	0.48250*	0.15899	0.75980**	0.30004	0.09083

	MKT_VALUE- FE	BN_RETURN- FE	TOBINS_Q - FE	ROE - Pooled	ROA - FE
	(0.22286)	(0.11190)	(0.24041)	(0.30173)	(0.47540)
Δ IBOVESPA	0.74292***	-0.17359**	0.33481**	0.29500	0.36095*
	(0.11420)	(0.04612)	(0.09496)	(0.17820)	(0.16585)
SIZE_A	-0.22380*	-0.06860*	0.04627	-0.00754	-0.00511
	(0.10333)	(0.02950)	(0.07150)	(0.04656)	(0.19874)
CONSTANT	3.98933+	1.20690*	-0.83812	0.41231	0.72888
	(1.94436)	(0.48755)	(1.26977)	(0.64248)	(3.43356)
AIC	20.79562	-4.96e+02	-1.56e+02	622.38160	595.20327
BIC	65.29068	-4.51e+02	-1.12e+02	674.96667	635.65333
r2	0.421	0.116	0.281	0.059	0.045
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

Table 10 – Models estimating the effect of total investment in intangibles on our dependent variables, allowing for differential effects per bank category

	MKT_VALUE- FE	ABN_RETURN- FE	TOBINS_Q - FE	ROE - Pooled	ROA – FE
Δ ROE	-0.02000	0.02178	0.01030		
	(0.02798)	(0.01266)	(0.03005)		
SR	**12.08419*** **	-2.65596	2.21541	-4.54096	-0.85535
	(2.09717)	(1.94112)	(2.18607)	(4.47691)	(5.81181)
SR* RETAIL_N	**-7.05389*** **	**4.94050***	0.92831	5.03752	-1.77254
	(1.66240)	**(1.99394)**	(2.34771)	(4.72739)	(6.06478)
SR* RETAIL_R	**-9.66449*** **	**4.08983***	-0.36713	3.77550	-2.28966
	(2.00234)	**(1.93443)**	(2.15794)	(4.42082)	(5.94295)
RISK	0.01962	0.04453	-0.01045	-0.03992	0.02360
	(0.08108)	(0.04833)	(0.02803)	(0.06282)	(0.06277)
LEVERAGE	0.20173	0.09559*	0.03234	0.25419	0.36629
	(0.14209)	(0.04270)	(0.05898)	(0.19614)	(0.24881)
DIV_ESPEC	0.00773	-0.04502+	0.07734	-0.16596	-0.02477
	(0.04812)	(0.02288)	(0.07195)	(0.12880)	(0.15697)
RETAIL_N				0.15606	
				(0.23036)	
RETAIL_R				0.13571	
				(0.12077)	
D_CRISIS	0.06141	0.03352	0.10792	-0.10379	-0.18840
	(0.10011)	(0.03433)	(0.08362)	(0.08227)	(0.18637)
Δ GDP	0.68813*	0.25159+	0.89882**	0.26359	-0.04784
	(0.24054)	(0.12320)	(0.24179)	(0.31072)	(0.45664)
Δ IBOVESPA	0.68214***	-0.18440***	0.30212**	0.31426	0.39397*
	(0.11127)	(0.04304)	(0.09865)	(0.18249)	(0.15892)
SIZE_A	-0.25286*	-0.06863	0.03462	-0.00851	0.01047
	(0.11296)	(0.04176)	(0.07536)	(0.05063)	(0.19439)
CONSTANT	4.50214*	1.23317+	-0.64857	0.43012	0.47060
	(1.98380)	(0.67507)	(1.35835)	(0.68294)	(3.33555)
AIC	-0.32384	-5.08e+02	-1.70e+02	621.09521	589.33063
BIC	44.17122	-4.63e+02	-1.26e+02	673.68027	629.78068
r2	0.449	0.141	0.305	0.062	0.059
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

Table 11 – Models estimating the effect of total investment in intangibles on our dependent variables, allowing for differential effects per bank category

	MKT_VALUE- FE	ABN_RETURN- FE	TOBINS_Q - FE	ROE - FE	ROA – FE
Δ ROE	-0.01297	0.02020	0.02592		
	(0.03191)	(0.01606)	(0.03045)		

	MKT_VALUE- FE	ABN_RETURN- FE	TOBINS_Q - FE	ROE - FE	ROA – FE
RR	1.13639	-0.27820	**4.15776*****	**-9.58064*****	**-10.34471*****
	(1.18700)	(0.19909)	**(0.61016)**	**(0.59600)**	**(0.42654)**
RR* RETAIL_N	22.20343^{+}	-4.07319	-6.96669	7.04863	9.59744
	(11.26432)	(4.71289)	(5.84093)	(16.76196)	(11.98904)
RR* RETAIL_R	17.62993^{+}	5.48547^{+}	5.52898	**-13.88425****	**-11.69081***
	(9.57296)	(3.05064)	(4.89313)	**(4.28481)**	**(5.48351)**
RISK	-0.00012	0.04806	-0.00897	0.00925	0.02311
	(0.07131)	(0.04737)	(0.03101)	(0.06877)	(0.07411)
LEVERAGE	0.08938	0.05791	-0.01302	0.25236	0.42386^{+}
	(0.12403)	(0.05531)	(0.06771)	(0.22488)	(0.21985)
DIV_ESPEC	0.00890	-0.03611	0.12715*	-0.20073	-0.14453
	(0.04559)	(0.02489)	(0.05535)	(0.17420)	(0.17420)
D_CRISIS	0.02024	0.01409	0.08415	-0.19017	-0.14192
	(0.09647)	(0.03137)	(0.07264)	(0.19494)	(0.20616)
Δ GDP	0.47873*	0.15535	0.74733**	0.05355	0.18756
	(0.21866)	(0.10924)	(0.23273)	(0.49850)	(0.50141)
Δ IBOVESPA	0.72732***	-0.16611**	0.34015**	0.33449^{+}	0.33255^{+}
	(0.10981)	(0.04619)	(0.09743)	(0.18910)	(0.15802)
SIZE_A	-0.23867*	-0.06736^{+}	0.05941	-0.14720	-0.01052
	(0.10862)	(0.03835)	(0.06478)	(0.21427)	(0.21254)
CONSTANT	4.11490*	1.17791^{+}	-1.09460	2.96001	0.87752
	(1.93172)	(0.60537)	(1.17102)	(3.64952)	(3.63080)
AIC	5.01457	-4.90e+02	-1.79e+02	564.23882	569.45608
BIC	49.50963	-4.46e+02	-1.35e+02	604.68887	609.90613
r2	0.442	0.104	0.319	0.094	0.102
Obs.	422	422	422	422	422

Source: Elaborated by the authors, 2020.

5 CONCLUSIONS

This paper contributes to the identification of factors that explain the heterogeneity in the performance of publicly-traded banks in Brazil, addressing one of the main concerns of strategy researchers about performance heterogeneity (COSTA; COOL; DIERICKX, 2013; CROOK *et al.*, 2008). We used a quantitative approach, based on hand-collected public data from banks' financial statements, combined with a history of trading and accounting values, which constitutes as methodological contribution, given that the previous literature focus on case studies or on particular categories of intangible resources (CHEN; DANBOLT; HOLLAND, 2014; KAMASAK, 2017; YING; HASSAN; AHMAD, 2019).

Our results show that total investments on Intangibles (SUM_IR) have positive capital market effects, even though in our sample they have a negative effect on accounting returns (measured by ROE and ROA). That suggests that the markets are paying attention to long-term effects of the investment in intangibles, even when short-term profitability is sacrificed. Additional analyses show that most of this effect is obtained from investments on Structural

or Organizational Intangible Resources (SR). We have also showed that there are different accounting and capital markets effects for different bank categories, which could be subject of further research.

Our analyses also shows that investments in Human Intangible Resources (HR) significantly affected the Market Value of National Retail Banks (RETAIL_N), for which there is a larger coverage of investment analysts. Regional (RETAIL_R) and Niche Banks (B_NICHE), for which HR presented no significant relation to capital market effects, could benefit from inducing larger analyst coverage or by making clearer or more salient disclosures about their investments on HR. In that sense, our results differ partially of Miller, Xu and Mehrotra (2015) and Krause, Semadeni and Withers (2016), because some banks in our sample are not particularly sensitive to investments on HR, but respond in an economically significant way to investments on SR.

We identified that HR investments have a different impact for different banks, particularly regarding the scope and operation of the banks (RETAIL_N e RETAIL_R). Our results demonstrate that external factors poorly explain different levels of performance within the same industry, as Villalonga (2004) and Kumlu (2014) highlighted, which reinforces the importance of RBV and of intangible resources in explaining the heterogeneity in the performance of companies.

The use of different types of investments in intangible resources, considered together (SUM_IR) and separately (HR, SR and RR), allowed us to identify how these resources add value to the banks in terms of accounting and market performance measures, filling an important gap present in the literature (ZIGAN, 2013). Our research design considers the effects of causal ambiguity and synergy on intangible resources, by focusing on a set of resources as drivers of organizational performance (BRAHIM; ARAB, 2011; KAMASAK, 2017).

We point out some paths for future research on intangible resources. Although Chadwick, Super and Kwon (2015) and Ndofor, Sirmon and He (2015) have contributed to the topic of Resource Orchestration - which considers the role of managers in the development, use and leverage of organizational resources – the RBV literature still lacks studies that explain their role in the management of investments in intangible resources and in the creation of

high value resources (ZIGAN, 2013). In order to overcome this shortage, there is the need for studies on the performance of managers in the development of intangible resources, by considering some elements as moderators of managerial actions, such as organizational core competencies, values of past investments in intangible resources, and past organizational performance (BRYANT, 2003; MANNOR; SHAMSIE; CONLON, 2016; MARCH, 1991).

Another suggestion for future research is to study intangible resources through a multidisciplinary approach. Although some authors, as Gu and Lev (2011), Silva *et al*. (2013) and Vomberg, Homburg and Bornemann (2015) have advanced in their operationalization and measurement, there still is a discussion on the need for a solid theoretical approach to the Resource Based View (RBV), which could increase the objectivity of the value measurement of intangible resources (MOLLOY *et al.,* 2001).

As previously mentioned, further research could be conducted on the effects of analysts' coverage on the relation between investment in intangibles and capital market effects. Our results suggest that banks with large analyst coverage obtain higher market returns as a response to their investment in intangibles. As analysts may have an important role on processing information that is not salient in the Banks' financial statements, further research could address this aspect, particularly focusing on the effects of objective interventions with the objective of increasing analyst coverage.

The results obtained in our paper may have been affected by the size of the database available, including the number of banks present in the sample and number of observations. On the other hand, we contribute to the literature by studying the Brazilian banking market, in which there is a strong market concentration, but there is also a movement of increased market competition after the 2008 financial crisis (SMANIOTTO; ALVES, 2016). We suggest that future research uses contexts that allow for a higher number of observations for analysis and discussion, while considering relevant differences between developed and emerging markets.

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