

Full Length Research Paper

Competitive advantage in the Brazilian telecommunications market: An analysis founded upon the resource-based view in the post-privatization period

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Received 8 April, 2014; Accepted 22 July, 2014

This paper examines which resources were responsible for the superior performance, between 1999 and 2008, of companies in the Brazilian telecommunications sector after privatization. The study methodology was founded on the Resource-Based View (RBV) and used data envelopment analysis (DEA) to investigate companies' performance. Using the performance ratings generated by the DEA model, we performed a multiple regression in which the independent variables were tangible and intangible organizational resources, to investigate the relevance of such resources to business performance. As tangible assets, we evaluated the relevance of the customer base in telephone access and revenue generating units (RGUs), and the product portfolio offered by the organization. As intangible factors, we analyzed Tobin's Q, trademarks and the origin of the capital that privatized each organization. All tangible resources and origin of capital evaluated were relevant to determine a company's performance. Therefore, network effects and a strategy based on diversification of a converging portfolio are factors that influence organizational performance in this market. Companies managed by national groups presented better performance, suggesting that part of the performance can be attributed to prior knowledge of the country where the company operates. The results reinforce the pillars of RBV, which has evolved since the criticisms of Priem and Butler with empirical tests on resources that have influence on organizational performance.

Key words: Telecommunications, privatization, competition, performance, market.

INTRODUCTION

Despite competitive (and, therefore, strategic) lines of thought emerged in the second half of the nineteenth century with the emergence of large corporations

(Ghemawat, 2002), competition in the Brazilian telecommunications industry only began shortly before the beginning of the twenty-first century in 1998. Previously

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Table 1. Growth of telecommunications services.

Period Ratio	Before privatization		After privatization	
	1988/1993	1993/1998	1998/2003	2003/2008
LL density (accesses/100 inhabitants)	26.7%	63.2%	79.0%	- 3.6%
MP density (accesses/100 inhabitants)	-	-	482.2%	198.1%
BI density (accesses/100 households)	-	-	-	609.4%
PTV (accesses/100 households)	-	-	22.6%	53.9%

Source: TELECO (2010) and ANATEL (2010).

dominated by state enterprises, this sector was privatized, allowing companies to compete with each other, increasing their scope of action, both geographically and in terms of products.

The privatization of the Brazilian telecommunications industry has since generated multiple research interests, such as regulation (Passos, 2008), value creation (Pretola, 2008), innovation (Adamo, 2007; Krauspenhar, 2007) and competition (Gomes, 2003; Filho, 2004; Guimarães, 2005).

The privatization of the industry also led to the founding of many new companies, creating a competitive environment that did not exist when the government was responsible for providing access to telephone services. In this new scenario, the government became the industry regulator and created the National Telecommunications Agency (ANATEL). Post-privatization growth has been remarkable, as shown in Table 1, which outlines growth rates of the sector's main services, such as landlines (LL), mobile phones (MP), Broadband Internet (BI) and Pay TV (PTV). The last three services were virtually nonexistent before privatization of the sector.

In total, twelve companies were privatized, including fixed-line, mobile, long-distance and data-communication carriers. At the beginning of market regulation, the companies' operational scope was restricted to the franchise product (landlines, mobile phones or long-distance calls). However, as indicated by Santos (2006) and Oliveira (2006), several mergers and technological reconfiguration of the market have led to services convergence and an oligopoly structure. All these factors (that is, formation of large groups of companies, expansion of indicators, falling prices and technological convergence) show a change in the competitive environment of this market.

According to Ghemawat (2002), with the appearance of large companies, studies of strategy and competitiveness focused on understanding the reasons behind the superior performance of some companies. One school of thought that analyzes this phenomenon is known as the Resource-Based View (RBV) and the study conducted by Wernerfelt (1984) is one of the pioneers in this field. For RBV, the exploitation of rare and imperfectly mobile resources is what allows greater gains.

Thus, this paper asks the following research question:

From the perspective of a RBV, what are the reasons for

superior performance in the post-privatization period of the Brazilian telecommunications market (provision of access to telephone, Internet and pay-TV services)?

Therefore, the main purpose of this paper is to examine which resources explain the companies' superior performance. According to RBV, resources that lead to superior performance may be tangible or intangible, so it is necessary to evaluate both. The aims of this study will be met by developing a performance ranking of the firms privatized, using Data Envelopment Analysis (DEA) combined with multiple regression, where the independent variables are the organizational resources used to generate performance in the organization. Using the Brazilian market as the study object, the paper provides a better understanding of how companies in an emerging economy can outperform competitors in this market. So, the outcomes of this research can help managers who face similar situations to make better investment and competitive decisions.

THEORETICAL FRAMEWORK

For Barney (2002), the central question to be answered in studies on strategy is: Why do some companies perform better than others? The first important definition when one tries to answer this question is related to performance. Due to the number of stakeholders involved with the organization, according to the author there is no standard (or even method) of measuring performance that cannot be called into question.

Organizational performance

Carton and Hofer (2006) verified that, between 1996 and 2001, 133 of a total of 138 papers published in some of the major management journals had different constructs for measuring organizational performance. This finding demonstrates the difficulty in adopting a single standard for measuring organizational performance.

In strategy, the expression "superior performance" is usually linked to competitive advantage. According to Brito and Vasconcelos (2005), the ROA (return on assets) ratio is traditionally used in strategy research while Carton

and Hofer (2006) also posit that it is the most widely used. Besanko et al. (2007) define competitive advantage as the situation in which a company has a profit rate higher than its sector average. Therefore, the ROA ratio is applicable to the concept of Besanko et al. (2007). This definition is similar to Peteraf and Barney's (2003), 'competitive advantage is the ability to create more economic value than the marginal competitor in a market'.

Resource-based view and strategy

For Wernerfelt (1984), one of the pioneers of RBV, the possession and use of rare resources lead to high yields, as this can create barriers to competition. However, the definition of resources is quite broad, so it is quite difficult to identify exactly which resource is responsible for superior performance. Barney (2002, p.155) defines resources as any "assets, capabilities, competencies, organizational processes, firm attributes, information, knowledge and also outputs that are controlled by a firm and enable the firm to conceive of and implement strategies." Therefore, any tangible or intangible factor present in the organization can be seen as a potential generator of greater earnings, if it is properly used by the organizational strategy. The study of Rumelt (1991) is often cited as one of the pillars of RBV, since the author attributes the difference in profitability of different organizations to factors specific to each organization. Later, Peteraf and Barney (2003) defined RBV as a theory of rents as well as a theory of competitive advantage.

RBV assumes that firms are heterogeneous, that is, they have a different set of resources. This means that they envisage different opportunities to generate revenue in a given situation, since the combination of current resources with the future resource will be different for each organization in the market (Wernerfelt, 1984). Dierickx and Cool (1989) also say that, besides being unique, the resources that enable superior gains are imperfectly mobile, that is, they cannot be freely acquired in the market. In addition to being imperfectly mobile, the resources have to be inimitable. Peteraf (1993) also contributes to the analysis, stating that, in order to generate high revenues, the resources must impose ex-post limitations to competition and have ex-ante limits to competition.

It is important to highlight that RBV is not the only theoretical school that attempts to explain the difference between firms' performances. For Ghemawat (2002), numerous schools of thought have emerged, of which it is worth highlighting the classical economic school (where high yields would result from effects such as the learning curve or economies of scale) and the theories of Porter (1980), where high profitability of some companies would be explained by the competitive forces of the industry in

which they operate. For Sheehan and Foss (2007), the value-chain approaches of Porter (1985) and RBV supplement each other, since the analysis of the value chain - and its drivers of costs or uniqueness - may help identify which resources can be exploited to implement a strategy that will allow the company to increase its gains. As delineated by Barney et al. (2011), RBV has undergone an evolution similar to product life cycle: introduction, growth, and maturity. In the maturity stage (from 2001 till date), RBV became an important theory to contribute to other fields of management science, like human resources management, property rights theory and entrepreneurship. Then, contributions to resource-based theory must provide a better understanding of how valuable resources can be developed.

Which resources are valuable?

Since the definition of resources varies widely, it is necessary to define which resources will be assessed in any study on RBV. The examples in the literature are extensive. Barney and Clark (2007) dedicated a book to the subject, in which they mention four basic resources as sources of superior performance: organizational culture, trust, human resources and capability to manage information technology (IT); considering that trust refers to the contractual structure the company has with its customers and suppliers. The competitive advantage may result from this resource depending on the transaction costs involved in managing such contracts (incentives and penalties). Culture, human resources and IT management skills are all intangible assets, with strong causal ambiguity, so it is difficult to evaluate them empirically.

There are other resources mentioned in the literature on RBV. In simple terms, the resources that create a competitive advantage impose barriers on competition, being imperfectly mobile or inimitable. For Besanko et al. (2007), the effects of pioneering and impediments to imitation form these barriers. With respect to pioneering, gains are generated by the size of a firm (economies of scale and experience curve) or the know-how of some specific activity. Impediments to imitation arise when there is better access to customers or inputs, high switching costs or patents to protect the organization's products.

Due to the difficulty encountered by managers to identify and utilize the valuable resources of an organization, some authors, such as Priem and Butler (2001) criticize RBV. Therefore, RBV has evolved by exploiting resources which can be exploited to obtain a sustainable competitive advantage.

Ahuja and Katila (2004) demonstrate that creation of resources depends on specific situations (problems or opportunities) encountered by organizations. Therefore, development of resources is linked to their past. This

dependence on the past has been empirically tested with the age of the company being one of the variables that influences an organization's performance. Kapelko (2009) and Delios and Beamish (2001) are just some of the authors that have used this variable in their studies and obtained similar results in their analyses, which showed that this variable was not relevant.

Kapelko (2009) used Tobin's Q ratio - defined as the ratio between a company's market value and the replacement value of its physical assets (Famá and Barros, 2000) - as a measure of intangibility to evaluate its effect on organizational performance, confirming the hypothesis that intangibility is positively related to organizational performance. The use of Tobin's Q for calculating intangibility is based on the finding that the market equilibrium price of a company should be equal to the replacement price of its assets, causing the value of Tobin's Q to be close to 1 (one). Higher prices are interpreted as non-measurable sources of value, which are attributed to intangible assets. Delio and Beamish (2001) also found the relationship between intangibles and performance to be a relevant factor, identifying that the presence of intangible assets also affects the performance of subsidiaries.

Control structure was also assessed by some studies, on the assumption that firms with lower agency driven costs are more efficient (Durand and Vargas, 2003). In addition, the authors also found evidence that the performance of leaner organizational structures is better. Holcomb et al. (2009) investigated the influence of human resources on the creation of value, supporting the hypothesis that managerial ability affects the productivity of the resources. In addition, the authors found evidence that the quality of the human resources moderates the effect of managerial ability, demonstrating the importance of human resources as a source of value creation.

Therefore, it is noted that RBV's explanation of what resources justify superior performance has evolved. However, there has been a lot of variation in the studies with respect to which resources of interest to the researcher's study are chosen for analysis. No model exists to evaluate what resources should be targeted by the researcher.

METHODOLOGY

For Rouse and Daellenbach (1999), studies that seek to understand the sources of competitive advantage should use smaller samples, preferably from a specific industry. This is because companies in the same industry share strategic market factors and also because of the influence of the industry's characteristics on strategic decisions. So the first step for a study with this objective is to define which firms (object of the analysis) should be part of the study. We selected the twelve holding companies privatized in 1998 (Embratel, Telesp, Tele Centro Sul, Tele Norte Leste, Tele Norte Celular, Telesp Celular, Tele Sudeste Celular, Tele Centro Oeste Celular, Tele Leste Celular, Telemig Celular, Tele Celular Sul, Tele Nordeste Celular).

The period of analysis corresponds to the post-privatization

period, which began in 1998.1999 is the first year in which information about the companies is available. The companies were analyzed up to 2008, therefore totaling ten years' analysis, with the study being characterized as a longitudinal study.

As can be observed, the sample includes companies that, although considered operators within the telecommunications industry, compete with different products. This is the case with the companies providing Mobile Phone (MP) access in relation to the Land Line (LL) access providers. However, according to the definition of Besanko et al. (2007), in which companies compete with each other, if any marketing decision made by an organization affects the production level of another, it is possible to classify these companies under the same competitive scope. Filho (2004), Oliveira (2006) and Santos (2006) found that one of the factors forcing changes to the strategies of companies in the telecommunications industry is the increasing replacement of landlines by mobile phones, intensifying the competition among firms. This occurs because of the technological development associated with the industry, which moves quickly towards convergent offers, where more than one product is blended to meet the customers' needs. This evidence justifies the grouping of companies for analysis even though there are technological differences among them. Another point that confirms the competitive convergence among companies with differing main products is the scenario of consolidation in the industry, which already has a significant number of companies capable of providing both services (LL and MP). The other main products in the market, Pay-TV (PTV) and Broadband Internet (BI) access are also provided by more than one of the companies analyzed. It will be interesting to assess to what extent the presence of a company's main industry products may or may not be responsible for the superior performance of that company.

Rouse and Daellenbach (1999) also affirm that, in order to highlight the influence of resources, it is necessary to establish a ranking of companies' performance to enable evaluation of the influence of resources on performance. After the work of Majumdar (1998) was published, the Data Envelopment Analysis (DEA) method started to be used to evaluate the influence of resources on performance. The DEA is a method that uses some input variables to explain output variables, creating an efficiency ranking based on linear programming. Thus, the decision-making units (DMUs), which may be firms, industrial plants or organizational units, are classified according to their efficiency when using inputs to generate outputs.

By combining DEA modeling with multiple regression, it is possible to filter the effect of non-discretionary variables (Ramanathan, 2003). With the efficiencies obtained in the model, we perform a multiple regression in which the independent variable is the non-discretionary variable. Thus, the methodological construct of this research can be observed in Figure 1.

DEA modeling

For Charnes et al. (1978), the DEA technique enables measurement of DMU efficiency when using available resources to generate outputs. A DMU can be an organization, industrial plants, offices, government agencies and even individuals (Ramanathan, 2003). In a DEA model, the DMUs are evaluated against the most efficient DMU, on a scale of 0 to 1. Thus, the efficiency rating of the most efficient DMU is equal to 1 (100%) and the others are ranked according to their distance from the most efficient DMU.

Two DEA models are used with more frequency: CRS (constant returns to scale) and VRS (variable returns to scale). The difference between the models lies in the fact that, in the VRS model, there is the possibility of variation in the level of efficiency according to the level of input used in the generation of outputs. That is, the VRS model assumes that there may be economies in the use of inputs, generating outputs that are proportionately larger (Ramanathan,

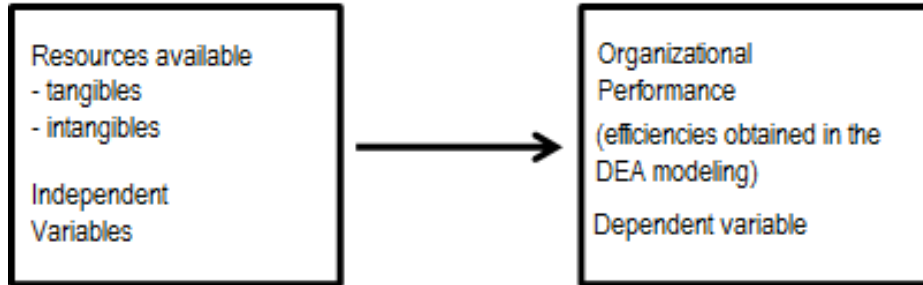


Figure 1. Methodological research construct.

BCC Model - Input orientation	BCC Model - Output orientation
Maximize $\sum_{r=1}^m u_r y_{rk} - u_k$	Minimize $\sum_{i=1}^n v_i x_{ki} + v_k$
Subject to:	Subject to:
$\sum_{r=1}^n v_r x_{rk} = 1$	$\sum_{r=1}^m u_r y_{rk} = 1$
$\sum_{r=1}^m u_r y_{rj} - \sum_{i=1}^n v_i x_{ij} - u_k \leq 0$	$\sum_{r=1}^m u_r y_{jr} - \sum_{i=1}^n v_i x_{jr} - v_k \leq 0$
$u_r, v_i \geq 0$	$u_r, v_i \geq 0$
Considering: $y = \text{outputs}; x = \text{inputs};$ $u, v = \text{weights}$ $r = 1, \dots, m; i = 1, \dots, n; e$ $j = 1, \dots, N$	Considering: $y = \text{outputs}; x = \text{inputs};$ $u, v = \text{weights}$ $r = 1, \dots, m; i = 1, \dots, n; e$ $j = 1, \dots, N$

Figure 2. BCC models. Source: Périco et al. (2008).

2003).

The model adopted in this study – the VRS - is the one traditionally adopted in RBV studies, such as the studies of Kapelko (2009), Souza et al. (2010) and Majumdar and Venkataraman (1998). The mathematical formulation of the VRS modeling is shown in Figure 2.

The output used in the modeling was the ROA ratio. The inputs used were ratios that represent the employment of value to generate output. Direct Margin, Sales Turnover, Ratio of Equity to Total Capital and Ratio of Non-Permanent Assets to Total Assets were the inputs chosen. All data were collected on companies' financial reports. Thus, the model generates a ranking where companies are listed according to their efficiency in leveraging their assets, sales, margin and equity in the generation of the output (ROA).

Evaluation of resources in the organizational performance

Since the definition of resources varies widely (Barney, 2002), it is necessary to determine which resources would be evaluated in this study. Separating the resources into tangibles and intangibles was the first step. Thus, this research will evaluate the influence of both on organizational performance.

As tangible resources, we evaluated the representativeness of

the customer base, the portfolio of products offered compared to competitors and the representativeness of the customer base of the revenue generating units (RGUs). The RGUs are the sum of the base of the sector's main products (LL, MP, BL and PTV).

As intangible assets, we evaluated Tobin's Q, the origin of the capital used to privatize the companies and the trademarks registered in the period. Table 5 describes the variables and the reasons for choosing each one.

Except for the amount of registered trademarks, collected on National Institute of Industrial Property, data were gathered on companies' annual reports.

RESULTS

The results of the study will be divided into two parts: performance evaluation (according to the DEA model) and analysis of resources that influence performance.

Organizational performance with the DEA modeling

A necessary condition for application of a DEA model is

Table 2. Descriptive statistics of the DEA modeling variables for the period of analysis.

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Efficiency Ratio	106	0.6578	1.0000	0.9004	0.0977
ROA Corrected*	106	0.0001	0.3367	0.1915	0.0588
Non-Permanent Assets / Total Assets	106	0.1959	0.7203	0.4411	0.1289
Direct Margin	106	0.2572	0.5881	0.4355	0.0732
Sales Turnover	106	0.2966	1.1448	0.5758	0.1393
Equity / Total Capital	106	0.1362	0.7715	0.4667	0.1408

Note. ROA corrected is the value of the ROA ratio plus a k constant, in order for all the ratios to be positive. Without this constant, it is not possible to use the DEA due to the requirement that inputs and outputs be positive. This adjustment is based on the recommendation of Cook and Zhu (2007).

Table 3. Correlations between performance and independent variables.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Performance – Efficiency (1)	1.00	-0.01	-0.34**	0.45**	0.18	0.19*	0.23*
Tobin's Q (2)	-	1.00	0.06	0.28**	-0.00	-0.00	0.21*
Origin of Capital (3)	-	-	1.00	0.29**	-0.42**	-0.42**	-0.14
Product Portfolio (4)	-	-	-	1.00	0.36**	0.38**	0.35**
Customer Base (5)	-	-	-	-	1.00	0.99**	0.26**
Customer Base in RGUs (6)	-	-	-	-	-	1.00	0.27**
Trademarks (7)	-	-	-	-	-	-	1.00

Note. *significant values $p < .05$; **highly significant values $p < .01$.

the existence of a positive correlation between the input and output variables. This condition was met, with the values of all inputs showing significance greater than 95%. Direct Margin, Sales Turnover and Equity Representativeness were such inputs, showing significance above 99%.

The descriptive statistics of the variables used in the modeling, as well as the efficiency indices of the DEA modeling, are shown in Table 2.

Table 2 shows that the least efficient company over the period was given a rating of 0.6578 (Tele Sudeste Celular, in 2005). Because the DEA model used is the VRS, more than one company was given the maximum efficiency rating, namely; Tele Centro Sul (in 2000, 2001 and 2006), Telesp (1999, 2000, 2001, 2004, 2005, 2006), Tele Norte Leste (1999, 2001, 2002, 2007, 2008), Tele Centro Oeste Celular (2002, 2003 and 2004).

Resources exercising influence on organizational performance

To study the influence of resources on the performance of the companies analyzed in this study, we performed a multiple regression, the dependent variable of which was the efficiency ratio obtained in the DEA modeling. The independent variables were the tangible and intangible resources described in section 3.2. Table 3 shows the

correlations between performance and the resources analyzed (independent variables).

The performance (variable 1) showed that there was, respectively, a low correlation (0.23) and (-0.34) with trademarks (variable 7) and origin of capital (variable 3). There was also very low correlation (0.19) with the customer base in RGUs (variable 6). It is worth highlighting the moderate correlation (0.45) found between performance and the product portfolio (variable 4). Tobin's Q (variable 2) showed low correlation (0.28) with the product portfolio and trademarks. The origin of the capital correlated moderately (0.42) with the customer base (variable 5) and the customer base in RGUs. It also showed low correlation (0.29) with the product portfolio.

The portfolio showed low correlation with all variables, except performance, with which the correlation was moderate. The customer base correlated very strongly (0.99) with the customer base in RGUs. The correlation found with the customer base was low (with the variables "trademarks" and "product portfolio") or moderate (with the variable "origin of capital"). The customer base in RGUs showed low correlation with the trademarks.

The Tobin's Q ratio was used in this study as an indicator of intangibility, as in the study undertaken by Kapelko (2009). However, the result was different from that found by that author, where the intangibility linked to Tobin's Q was relevant.

Through application of a multiple regression with the

Table 4. Organizations performance regression.

Variables	Coefficient	Deviation	T	p
Constant	0.92539	0.03646	25.38	0.000
Tobin's Q	-0.02984	0.02526	-1.18	0.240
Origin of Capital	-0.06807	0.02586	-2.63	0.010
Customer base	-6.216	2.386	-2.61	0.011
Customer Base in RGUs	6.441	2.527	2.55	0.012
Trademarks	0.5952	0.6830	0.87	0.386
Portfolio	0.10987	0.03405	3.23	0.002
r ²			32.7%	
Adjusted r ²			28.6%	

Table 5. Independent variables: resources evaluated in the study.

Resource	Unit of Measurement	Reason
Customer base	Market share in total phone accesses	Possibility of network effects, since the contribution margin is greater for voice and data traffic within the same network.
Portfolio	Number of products available in the portfolio, compared to the competitor with the largest portfolio in the period [involving LL, MP, BL, PTV and long distance (LD)].	Companies that are capable of offering more than one product in the telecommunications market are able to increase their average revenue per user (ARPU), increasing their profitability.
Customer Base in RGUs	Market share in the total of products (PTV, BL, MP and LL accesses).	Companies that are capable of offering more than one product can increase their average revenue per user in a proportion greater than the cost incurred for this.
Tobin's Q	$Q = (VMA + D) / AT$	Tobin's Q values greater than 1 (one) indicate that the company has a portion of value attributed to intangible factors.
Origin of Capital	0 (zero) for national capital; 1 (one) for foreign capital.	As competition in this sector did not exist in Brazil, companies that were acquired by international telecommunications groups were likely to outperform other companies.
Trademarks	Percentage of the total of applications for trademarks (or still in the process of being approved) compared to other companies.	As stated by Porter (1985), brands can assign value to the products and services of a company. A large number of trademarks may increase the value of a company, due to the high intangibility that can be attributed to certain brands.

Note. VMA is the company's market value, D is the market value of the organization's debts (calculated as the sum of current liabilities, stocks and long-term debts; less the value of the current assets) and AT is the value of the firm's total assets. This calculation formula is the one proposed by Chung and Pruitt (1994).

Independent variables, we obtained the coefficients shown in Table 4.

As shown in Table 4, some variables were not significant, so $p < 0.05$ was adopted as a parameter. The non-significant variables were Tobin's Q and the trademarks. Both variables are indicators that the companies' performance is supported by intangible factors, high social complexity and laden with causal ambiguity.

The other variables were shown to be significant. The origin of the capital proved to be a variable of negative correlation with performance measured by the DEA ranking. As the value of the "origin of capital" variable was zero for domestic capital and one (1) for foreign capital, the performance of enterprises with domestic

capital only was shown to be better. The only companies run by shareholders comprised solely Brazilian groups were Tele Norte Leste and Tele Centro Oeste Celular (until it was merged into Telesp Celular to form Vivo). The results of these two companies proved to be superior to the others and is why this variable is considered significant in the model. It is worth highlighting that after the Tele Centro Oeste Celular management was replaced, this company's performance dropped. The holding companies privatized in 1998 were acquired, mainly, with the participation of foreign groups already operating in the telecommunications market. As noted, the experience of these groups in other countries did not help improve the performance of such companies.

Two variables that can be jointly analyzed are the customer bases (telephone accesses and RGUs). Both were quite significant, but with a positive coefficient for one (RGUs) and negative coefficient for the base in accesses. Although they are highly correlated, exclusion of any of the variables decreases the model's r^2 , highlighting the complementarity between them. That is, in addition to the networking effect being important in the industry (due to cost reduction brought about by the increase in customer base in accesses), there is also the potential increase in performance linked to possession of more products by the telephone access subscriber base. The effect of the remaining variable, portfolio, confirms the importance of the customer base combined with the increase in the RGU base. The "portfolio" variable showed the highest correlation with performance, in addition to proving the most significant among all the variables analyzed. From the manner in which it was processed in the analysis (the company's product portfolio compared to the market), it is possible to observe a positive effect on performance through addition of more than one product offered by the company. This effect can be understood as the effect of technological convergence in the industry, since it was observed that companies with a converging portfolio outperform those lacking such a portfolio. This result can be compared with the work of Terziovski (2010), which found similar effect on company's performance using as one of the independent variables innovation strategy. So, innovation can be seen as a precursor of increasing an organization portfolio. So, we confirm this relationship.

The r^2 obtained in the model of this study (28.6%) is close to the value obtained in other studies, such as the work of Durand and Vargas (2003), which obtained 23.6%, and the work of Delmas et al. (2007), which obtained 27%. In these studies, other organizational resources were evaluated, such as the control structure, agency and the length of time that the companies had been operating in the market.

DISCUSSION AND CONCLUSION

This study attempted to identify which resources best explain performance in the post-privatization Brazilian telecommunications market (period between 1999 and 2008). It was observed that the market grew rapidly after privatization, as observed by Dinkelmann (2005). Those companies privatized in 1998 still account for a large portion of the main products on the Brazilian market (LL, MP, BI and PTV).

Twelve companies were privatized in 1998 and this number that had been reduced to eight by 2008. In 2009, the operations of Tele Norte Celular, Telemig and Tele Centro Sul were absorbed by other companies, reducing the number of companies privatized in 1998 to less than half. This sectorial landscape with so few competitors is

the result of technological reconfiguration in which merged companies obtain a more favorable position in the industry, as pointed out by Oliveira (2006) and Santos (2006). In addition to the technological reconfiguration, privatized companies were restricted to specific areas of operation. Expansion of the operating scope, granted after meeting targets imposed by ANATEL, often proves costly, due to necessary investment in infrastructure. Companies may expand the geographic market where they operate by absorbing or purchasing other companies.

The study conducted in this research has served to expose some valuable resources in the market analyzed, the stand out ones; the importance of the customer base in accesses and RGUs, factors that point to gains resulting from network effects and also from the diversification of product portfolios of companies in the sector. The importance of having a product portfolio that is bigger than that of competitors also appears to be relevant, highlighting the business opportunities created by the technological convergence of the sector.

It is possible to conclude that a significant part (r^2 of 28.6%) of the organizations' performance in the market analyzed is linked to tangible and intangible resources analyzed in this study. These resources are clients (accesses and RGUs) and the portfolio of products offered. However, intangible factors also prove important, due to the significance of the variable "origin of capital".

Those companies privatized through solely domestic capital were more efficient. This factor is apt for future research, considering the importance of the companies' global operation. To better understand this effect, the work of Wei et al. (2014) can be useful. The authors explored the relationship between adhocracy and clan culture on market responsiveness and companies' performance. So, given the importance of country values on culture (Hofstede, 2001), results presented in this research suggest that companies privatized with domestic capital can have a research advantage. Did the groups of foreign investors that helped privatize the sector meet their expected profit targets in the privatization process? To what extent may the culture of the country recipient of investment deter purchase of a company by a foreign group? These are just some questions providing starting points for future studies.

The results are consistent to Wernerfelt's (2011) that existing stock of resources generate asymmetries in competition for new resources. So, if an organization succeeds to reach a significant customer base (a valuable resource), it gets easier to obtain new resources, such as new products.

Barney (2002) posits a broad definition of resources, covering both tangible and intangible factors. This research was able to assign a portion of the performance to tangible resources, but further studies would be required to analyze the influence of intangible factors on the market analyzed.

Although the customer base is considered to be a tangible resource, some intangible potential is tied to a loyal customer base. As pointed out in this research, a customer base is essential to increase the share in RGUs. And that can only be done with a portfolio of products compatible with the customers' needs. In other words, companies with a bigger product portfolio have privileged access to their customers and may expand their customer base in RGUs.

Oliveira (2006) and Santos (2006) point out that companies in the Brazilian telecommunications sector are still in strategic positions relevant to best product or client solutions, but there is no system with complementary items that causes the client disregard other market options. This study found that companies offering more solutions than others have a competitive advantage. With the movements of consolidation in the industry, the firms are expected to have equivalent portfolios, at least regarding number of products offered. Another area for future research is that of the competitive dynamics of this new phase of the sector, that is, so few competing companies. The role of intangible resources may be even more relevant in the future.

Some of the resources evaluated in this research (customer base, customer base in RGUs and portfolio) demonstrated VRIO model adequacy (value, rareness, imitability and organization), because they are valuable, rare and costly to imitate (Barney, 2002). These three variables are related, since the increase in the base in RGUs depends on the company having a solid customer base, as well as a consistent product portfolio. Increasing the customer base whether in accesses or in RGUs requires investment in sales and network infrastructure. In turn, the "portfolio" variable requires investment not only to develop the company's internal infrastructure in order to provide the product, but also an initial capital expenditure to purchase the operating license. In December 2007, for example, ANATEL raised R\$ 5.3 billion by selling 3G operating licenses allowing MP carriers to operate. This acquisition cost is an entry barrier to the provision of some types of services and, in addition to the cost, a license may only be purchased when ANATEL opens tenders. So if a company chooses not to obtain a license and diversify its portfolio, this organization will be at a disadvantage compared to its competitors, at least until the next auction. This market dynamic creates ex-ante and ex-post competition limits, which are key criteria for a sustainable advantage (Peteraf, 1993).

The increase in the companies' portfolio suggests that some of them have changed their status in the industry and are starting to compete with all competitors. This is the case of Oi (Tele Norte Leste), for example. This company, result of the privatization of the LL service, also entered the MP market, offering product seen as a substitute for land-line telephony. Application of the Peteraf and Bergen (2003) model, which involves

identification of competitors based on resources, shows that both latent substitutes and differentiators as well as vertical substitutes have become direct competitors in the market. This has happened to MP companies (latent substitutes) and PTV companies (vertical substitutes), which have diversified their portfolio to compete in the BI and LL market. This change in the market's competitive dynamics is another opportunity for research. The privatized companies are known for their greater knowledge of the telephony market, but the current network can have a sunk cost effect (Besanko et al., 2007), inhibiting investments in innovation. A study similar to the one conducted in this research, but with inclusion of latent and vertical substitutes, can address this question. The consolidation of companies may facilitate the work of researchers interested in this topic. Rouse and Daellenbach (1999) recommend that researchers look for intangible resources within the organizations. Intangible factors such as culture, structure of contracts, resources and IT, cited by Barney and Clark (2007) as sources of competitive advantage, have high causal ambiguity, because they are socially complex. Exploratory qualitative studies can also be used to identify the importance of these resources in organizations. The importance of the VRIO model attribute "Organization" can be measured with this type of research (exploratory), or through studies focused more on the incentives given by the organization for companies to encourage use of resources, according to the Makadok (2003) model.

By looking at the data generated by this research, we can conclude that of itself, the customer base (accesses) does not guarantee superior performance, making more sophisticated strategies a requirement for increasing the market share. Portfolio diversification was one of the factors that emerged as a determinant of better performance.

The role of the intangibles (measured in this study with the variables "trademarks", "Tobin's Q" and "origin of capital") was shown to be important relevant to the origin of capital only. However, it should be emphasized that some brands registered by the companies reinforce elements considered by this research to be significant for organizational performance. Brands that reinforce relevant resources such as network effects and a complete portfolio of products stand out.

LIMITATION

As limitations, some resources were not included in the research design, such as management skills, routines and capabilities. This kind of resources, as outlined by Barney et al. (2011), can help companies to choose and implement strategies. Then, another restriction is that, although some resources were evaluated as valuable ones, the research does not explore how the resources

measured are related with consumer surplus. So, we assess competitive advantage and not value creation (Peteraf and Barney, 2003).

The relationship between resources and value creation make an interesting research opportunity for future studies. And, considering that in emerging economies competition appears to be less sophisticated (Kotler and Keller, 2011), research comparing value creation in the same industry but in different economic contexts can provide some appealing conclusions about which resources are more valuable in each context.

Conflict of interest

The authors has not declared any conflict of interest.

REFERENCES

- Adamo LA (2007). *Estratégias, Gestão da Inovação e Sistema Setorial de Inovação: Um estudo do setor de telecomunicações brasileiro*. (Doctoral dissertation, Mackenzie University, São Paulo, Brazil).
- Ahuja, G, Katila R (2004). 'Where do Resources Come From? The Role of Idiosyncratic Situations'. *Strategic Manage. J.* 25(8):887-907.
- ANATEL (2010). Sector Numbers. [online]URL:<http://www.anatel.gov.br/Portal/exibirPortalInternet.do#>
- Barney JB (2002). *Gaining and Sustaining Competitive Advantage*. 2nd Edition. New Jersey: Prentice Hall.
- Barney JB, Clark DN (2007). *Resource-Based Theory: Creating and Sustaining Competitive Advantage*. New York: Oxford University Press.
- Barney JB, Ketchen Jr. D, Wrigh M (2011). 'The Future of Resource-Based Theory: Revitalization or Decline?'. *J. Manage.* 37(5):1299-1315.
- Besanko D, Dranove D, Shanley M, Schaefer S (2007). *Economics of Strategy*. New York: John Wiley & Sons.
- Brito LAL, Vasconcelos FC (2005). 'A influência do País de Origem no Desempenho das Empresas', *Revista de Administração Contemporânea*. 9(4):97-118.
- Carton RB, Hofer CW (2006). *Measuring Organizational Performance: Metrics for Entrepreneurship and Strategic Management Research*. Cheltenham: Edward Elgar.
- Charnes A, Cooper WW, Rhodes E (1978). 'Measuring the efficiency of decision making units', *Eur. J. Oper. Res.* 3(4):429-444.
- Chung KH, Pruitt SW (1994). 'A Simple Approximation of Tobin's Q', *Financ. Manage.* 23(3):70-74.
- Delios A, Beamish PW (2001). 'Survival and Profitability: The Roles of Experience and Intangible Assets in Foreign Subsidiary Performance', *Acad. Manage. J.* 44(5):1028-1038.
- Delmas M, Russo MV, Montes-Sancho MJ (2007). 'Deregulation and Environmental Differentiation in the Electric Utility Industry'. *Strat. Manage. J.* 28(2):189-209.
- Dierickx I, Cool K (1989). 'Asset Stock Accumulation and Sustainability of Competitive Advantage'. *Manage. Sci.* 35(12):1504-1511.
- Dinkelmann DXP (2005). *Privatização das Telecomunicações no Brasil: Evolução da Telebrás para Novas Empresas Privadas*. (Master thesis, Ibmec Business School, Rio de Janeiro, Brazil).
- Durand R, Vargas V (2003). 'Ownership, Organization, and private Firms' Efficient Use of Resources'. *Strat. Manage. J.* 24(7):667-675.
- Famá R, Barros LA (2000). 'Q de Tobin e seu Uso em Finanças: Aspectos Metodológicos e Conceituais', *Caderno de Pesquisas em Administração* 7(4):27-43.
- Filho BD (2004). *Post-privatization competitive strategies for fixed telephony switched services (STFC) concessionaire companies in Brazil: a case study*. (Master thesis, Pontifical Catholic University, Rio de Janeiro, Brazil). http://www2.dbd.puc-rio.br/pergamum/tesesabertas/0116819_04_pretextual.pdf
- Ghemawat P (2002). 'Competition and Business Strategy in Historical Perspective'. *Bus. History Rev.* 76(1):37-74.
- Gomes RCO (2003). *Estratégias Competitivas de uma Empresa do Setor de Telecomunicações: O Caso Sercomtel S.A.* (Master thesis, Londrina State University, Londrina, Brazil).
- Guimarães HW (2005). *Avaliação da Competitividade de Empresas de Longa Distância Frente a Privatização do Setor Telecomunicações*. (Master thesis, Ibmec Business School, Rio de Janeiro, Brazil).
- Hofstede G (2001). *Culture's consequences: international differences in work-related values*. Beverly Hills, CA: Sage.
- Holcomb TR, Holmes Jr. M, Connelly BL (2009). 'Making the Most of What You Have: Managerial Ability as a Source of Resource Value Creation'. *Strat. Manage. J.* 30(5):457-485.
- Kapelko M (2009). *Intangible Assets and Firm Efficiency: International Analysis in the Textile and Apparel Industry*. (Doctoral dissertation, Universitat Autònoma de Barcelona, Barcelona, Spain).
- Kotler P, Keller KL (2011). *Marketing Management*. New Jersey: Prentice Hall.
- Krauspenhar MVB (2007). *O Lançamento de Novos Produtos e Serviços no Setor de Telecomunicações Móveis: Análise do seu impacto na geração de valor nas operadoras brasileiras*. (Master thesis, Fundação Getúlio Vargas, São Paulo, Brazil).
- Majumdar SK (1998). 'On the Utilization of Resources: Perspectives from the U.S. Telecommunications Industry'. *Strat. Manage. J.* 19(9):809-831.
- Majumdar SK, Venkatraman S (1998). 'Network Effects and the Adoption of New Technology: Evidence from the U.S. Telecommunications Industry'. *Strat. Manage. J.* 19(12):1045-1062.
- Makadok R (2003). 'Doing the Right Thing to Do: Why the Whole is Greater than the Sum of the Parts'. *Strat. Manage. J.* 24(10):1043-1055.
- Oliveira R (2006). *O Reposicionamento Estratégico das Operadoras de Telefonia Fixa Frente à Reconfiguração da Indústria de Telecomunicações no Brasil*. (Master thesis, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil).
- Passos CMO (2008). *Prática da Mediação na Agência Nacional de Telecomunicações - ANATEL*. (Master thesis, Universidade Federal Fluminense, Niterói, Brazil).
- Périco AE, Rebelatto DAN, Santana NB (2008). 'Eficiência Bancária: os Maiores Bancos são os mais Eficientes? Uma Análise por Envoltória de Dados'. *Gestão & Produção*, 15(2):421-431.
- Peteraf MA (1993). 'The Cornerstones of Competitive Advantage: A Resource-Based View', *Strat. Manage. J.* 14(3):179-191.
- Peteraf MA, Barney JB (2003). 'Unraveling The Resource-Based Tangle'. *Manag. Decis. Econ.* 24(4):309-323.
- Peteraf MA, Bergen ME (2003). 'Scanning Dynamic Competitive Landscapes: A Market-Based and Resource-Based Framework'. *Strat. Manage. J.* 24(10):1027-1041.
- Porter ME (1980). *Competitive Strategy*. New York: Free Press.
- Porter ME (1985). *Competitive Advantage*. New York: Free Press.
- Pretola RR (2008). *Inovação e Criatividade no Setor de Telecomunicações Brasileiro: Co-criando valor mediante processo de centralidade no cliente*. (Master thesis, Fundação Getúlio Vargas, São Paulo, Brazil).
- Priem RL, Butler JE (2001). 'Is the Resource-based "View" a Useful Perspective for Strategic Management Research?'. *Acad. Manage. Rev.* 26(1):22-40.
- Ramanathan R (2003). *An Introduction to Data Envelopment Analysis*. London: Sage Publications.
- Rouse MJ, Daellenbach US (1999). 'Rethinking research methods for the resource-based view: Isolating sources of sustainable advantage'. *Strat. Manage. J.* 20(5):487-494.
- Rumelt RP (1991). 'How Much Does Industry Matter?'. *Strat. Manage. J.* 12(3):167-185.
- Santos TBF (2006). *A Reconfiguração da Indústria de Telecomunicações: A Visão das Operadoras de Telefonia Móvel Operando no Brasil*. (Master thesis, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil).
- Sheehan NT, Foss NJ (2007). 'Enhancing the Prescriptiveness of the Resource-Based View Through Porterian Activity Analysis', *Manage. Decis.* 45(3):450-461.
- Souza MAF, Macedo MAS, Ferreira MS (2010). 'Performance of

- brazilian supermarket companies: a data envelopment analysis approach', *Revista de Gestão da USP*. 17(2):151-167.
- TELECO (2010). Broadband internet in Brazil. [online]URL:<http://www.teleco.com.br/blarga1.asp>
- Terziovski M (2010). 'Innovation Practice and its Performance Implications in Small and Medium Enterprises (SMEs) in the Manufacturing Sector: A Resource-Based View'. *Strat. Manage. J.* 31(8):892-902.
- Wernerfelt B (1984). 'A Resource Based View of the Firm', *Strat. Manage. J.* 5(2):171-180.
- Wernerfelt B (2011). 'The use of resources in resource acquisition'. *J. Manage.* 37(5):1369-1373.
- Wei Y, Samiee S, Lee RP (2014). 'The influence of organic organizational cultures, market responsiveness, and product strategy on firm performance in an emerging market'. *J. Acad. Market. Res.* 42(1):49-70.
- Zhu J, Cook WD (2007). *Modeling Data Irregularities and Structural Complexities in Data Envelopment Analysis*. New York: Springer Press.