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Impact of high and low-level capabilities on bank performance

Mehdi Younes Garrab [1, 2, *], Abdelkarim Yahyaoui [1, 3]

[1]*College of Business, University of Jeddah, Jeddah, Saudi Arabia*
[2]*Higher Institute of Management, University of Sousse, Sousse, Tunisia*
[3]*Faculty of Law, Economics, and Management Sciences, University of Jendouba, Jendouba, Tunisia*

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ABSTRACT

This study uses the resource-based view of the firm as a theoretical framework to examine the effect of high-level and low-level bank capabilities on market performance. A typology of bank capabilities was developed using an input/output approach to assess these capabilities. An empirical analysis was conducted on Tunisian deposit banks listed on the stock market. The data envelopment analysis (DEA) method was used to estimate the banks' capacities. The findings reveal that high-level bank capabilities are the key factors driving superior and sustainable performance. Additionally, the study confirms that horizontal coherence, achieved through aligning certain low-level capabilities, has a significant positive impact on bank performance.

1. Introduction

Bank performance is dependent on external factors and internal factors (Belkhaoui et al., 2014). Research in banking seeks to balance internal and external factors to explain performance differences among banks (Liu et al., 2010; Alfadli and Rjoub, 2020). Researchers conclude that the performance of a bank in an emerging country demonstrates the significance of both internal and external factors. Ownership structure, bank size, capitalization, and management efficiency all play a role (Gupta and Mahakud, 2020; Domanović et al., 2018). On the other hand, external factors such as macroeconomic stability and industry competition influence the performance (Alfadli and Rjoub, 2020). Studying the effect of bank capabilities is important as it provides a clear understanding of how banks can leverage their internal strengths to improve performance, by adapting to changes in the external environment. This adaptation enhances the bank's operational capabilities (Wang et al., 2022). Existing research often focuses on individual impact rather than a joint one (Alfadli and Rjoub, 2020), this suggests a need for a deeper examination of capabilities interactions effect on performance. Despite these advancements, a research gap is still obvious in understanding how different types of bank capabilities interact to influence bank performance. The resource-based theory stressed that the coherence of the portfolio of resources and capabilities held by the firm could explain its performance (Saa-Perez and Garcia-Falcon, 2002; Makhija, 2003). The application of the resource-based theory in the banking sector is minimal (Liu et al., 2010). Literature suffers from a lack of empirical studies validating the relationships between banking capabilities and performance (Lin, 2007). Given the multitude of definitions proposed for capabilities, it is essential to begin by setting up a typology, which must meet a hierarchical structure of capabilities (Collis, 1994). Referring to the typology of Collis (1994), we can differentiate between high-level and low-level capabilities. This classification is comparable to the one of Grewal and Slotegraaf (2007). This hierarchical classification suggests that the company's capabilities stem from the amalgamation of resources available across its internal hierarchical levels (Collis, 1994; Grewal and Slotegraaf, 2007). Lamarque (1999) proposed another classification based on banking activities and has developed a methodology for identifying bank capabilities based on the bank's value chain and business (fundraising, loans, and services). Lamarque (1999) conducted an empirical investigation that highlighted the taxonomy of banking capabilities, which includes basic skills, common distinctive competencies, specific distinctive competencies in fundraising, specific distinctive competencies in credit, and distinctive competencies specific to retail banking. This paper considers two types of banks' capabilities. The low-

* Corresponding Author.
Email Address: mygarrab@uj.edu.sa (M. Y. Garrab)
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Corresponding author's ORCID profile:
https://orcid.org/0000-0002-4791-3590

level banking capabilities are crucial for the operational execution of all banking activities (Lamarque, 1999). The high-level banking capabilities align with strategic management capabilities (Castanias and Helfat, 1991; 2001) and facilitate the development of a vision that guides the bank's policies and strategic decisions.

Given the difficulty of understanding the process by which bank capabilities contribute to performance, we propose in this paper to study the internal interactions of capabilities portfolios in the banking sector. This research aims to analyze the relationship between capabilities and bank performance by examining the impact of the coherence of the bank's capabilities portfolio.

One of the criticisms leveled against previous research is the nature of the measures used for resources and capabilities (Priem and Butler, 2001). The intangibility of capabilities poses a challenge for researchers and organizations in measuring them, as noted by Lamarque (2001), due to their inherent complexity.

Measuring capabilities on objective data uses three approaches, namely: The inputs approach (Zúñiga-Vicente et al., 2004; Lin, 2007; Papadopoulos, 2004), the outputs approach (Roberts and Amit, 2003), and the inputs/outputs approach (Dutta et al., 1999; 2005; Nath et al., 2010). Dutta et al. (2005) recommended the use of sophisticated tools, such as multi-criteria optimization methods, in the inputs/outputs approach.

This paper makes several significant contributions. Theoretically, this work applies resource-based theory to the banking sector. Conceptually, we propose a typology of bank capabilities. This paper empirically presents measures to assess the levels of capabilities and consistency, making it one of the few studies specifically focused on banks operating in emerging countries. This research paper starts with the theoretical foundation. Secondly, it outlines the methodology. Thirdly, it presents the results. Finally, it offers a discussion of the results and their implications.

2. Literature review and hypotheses development

The importance of capabilities in explaining bank performance can be identified by studying different levels of capabilities and their individual and collective impacts.

2.1. Low-level capabilities-bank performance

Several empirical studies have concluded that bank performance is dependent on the quality of low-level capabilities. The low-level capabilities, which include HRM capabilities, human capital efficiency (Alhassan and Asare, 2016), marketing capabilities, customer relationship management capabilities (Coltman, 2007), and technological capabilities or innovation capabilities (Blazevic and Lievens, 2004), are fundamentally functional.

Lamarque's (2001) research found a positive correlation between banks' competitive advantage and their banking capabilities. Thus, we can assert that the low-level capabilities positively influence bank performance.

H1. Low-level capabilities are positively related to bank performance.

2.2. High-level capability-bank performance

Lamarque (2001) explained that "management and organization of the bank" is a strategic capability. Grewal and Slotegraaf (2007) conducted an empirical investigation based on a sample of 105 commercial banks. The findings indicate a positive correlation between high-level capabilities and bank performance.

H2. High-level is positively related to bank performance.

2.3. Coherence of the bank capabilities portfolio and bank performance

In addition to individual contribution capabilities to bank performance, complementary capabilities can be a source of additional advantage (Dutta et al., 1999). As part of this research, we will focus on two types of coherence: Horizontal coherence and vertical coherence. Horizontal coherence corresponds to the interactions between low-level capabilities (human resource management, marketing, and information technology capabilities). Vertical coherence addresses the interaction of different levels of capability (high and low). This qualification of vertical and horizontal coherence is borrowed from the classification of Mintzberg's (1986) levels of internal coordination within the company.

2.3.1. Horizontal coherence and bank performance

Possessing valuable bank capabilities is not enough, but their combination is essential to generate value. Previous empirical work has revealed the importance of marketing capabilities in strengthening productive capabilities and performance (Dutta et al., 1999; Nath et al., 2010). Shum et al. (2008) have concluded an empirical investigation to study the importance of human resource management (HRM) capabilities in supporting a bank's marketing capability. Fedor et al. (2006) explained that the customer relationship management capability of the bank requires the commitment of the staff. Similarly, information technology capabilities interact positively with both marketing and HRM capabilities, which reinforces their positive impact on bank performance (Shum et

al., 2008). Yang (2012) conducted an empirical investigation in the banking sector to study the interaction between HRM, marketing, and information technology capabilities, and their impact on performance. The study confirms a positive relationship between horizontal coherence and bank performance.

H3. Horizontal coherence positively affects bank performance.

2.3.2. Vertical coherence and bank performance

The relationship between low-level and high-level bank capabilities and bank performance is supported by two grounded arguments. The first one states that the performance level corresponds to the bank's share of the relevant rent after negotiation with stakeholders. Therefore, the high-level capability plays a moderating role in strengthening the link between the low-level capabilities and performance. The second one highlights the importance of HRM capability in the development of the bank's strategic management capabilities (Saa-Perez and Garcia-Falcon, 2002). The strategic management capability will strengthen the bank's position by better managing the value generated by portfolio capabilities.

H4. Vertical coherence positively affects bank performance

3. Methodology

An empirical investigation using panel data increased the number of observations and the degree of freedom, which is likely to improve the quality of the estimation (Wu et al., 2007). In this study, we utilized the Arellano-Bover/Blundell-Bond generalized method of moments (GMM) estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). It accounts for the presence of latent bank-specific effects and any possible bias from time-invariant omitted variables. To address the issue of endogeneity in our analysis, we employed the GMM approach, thereby applying the first difference. Arellano and Bond (1991) introduced the GMM estimator, while Blundell and Bond (1998) developed the GMM system estimator. Blundell and Bond (1998) used Monte Carlo simulations to show that the GMM system estimator works better than the first difference GMM estimator. This is because the first difference GMM estimator gives skewed results in small samples when the instruments aren't strong. Blundell and Bond (1998) developed the GMM methodology, which has the advantage of rectifying endogeneity regardless of its sources. The GMM system method and sufficient lagged variables can also be used to rectify endogeneity in the main factors that explain something, as well as in variables that are susceptible to it. In this study, we utilized the Arellano-Bover/Blundell-Bond generalized method of moments (GMM) estimator. The GMM estimator recognizes the existence of latent bank-specific effects and potential bias from missing factors that persist over time. We employed the GMM technique, specifically the first-difference GMM estimator by Arellano and Bond (1991) and the GMM system estimator by Blundell and Bond (1998), to tackle the endogeneity issue in our research. Blundell and Bond (1998) developed the GMM methodology, which has the advantage of rectifying endogeneity regardless of its sources. Furthermore, the GMM system technique enables the correction of endogeneity in the variables of interest. Additionally, by comparing multiple inputs and outputs, the Data Envelopment Analysis (DEA), a non-parametric method for capability measurement, evaluates the efficiency of any decision-making unit (DMU). Furthermore, the DEA assumes that all DMUs are homogenous and operate under similar conditions (Panwar et al., 2022) and that all inputs and outputs are controlled by the DMU (Zubir et al., 2024). Moreover, a significant limitation of the DEA is its sensitivity to the selection of inputs and outputs, which can significantly impact the results (Zubir et al., 2024). Despite these limitations and assumptions, DEA remains a valuable tool for efficiency analysis in various fields.

3.1. Sample

The context plays an essential role in explaining and identifying factors that may explain the performance (Jarvenpaa and Leidner, 1998). Because of the binding nature of the environment in developing countries, the role of managers requires more importance.

In this case, the study of a single sector, the banking sector, provides a better understanding of the underlying specificities when testing models and discussing the results (Heiens et al., 2007).

The Tunisian financial sector was chosen for four main reasons:

- Liu et al. (2010) noted a deficiency in strategic studies, particularly those employing the resource-based theory, across a broad range of banking sector companies.
- The unique characteristics of developing countries and the dearth of research within the resource-based theory have been observed. This observation has encouraged Jarvenpaa and Leidner (1998) to seek to extend their source-based view to the context of developing countries.
- The application of the resource-based theory to a single sector can lead to more relevant results (Heiens et al., 2007).
- The financial sector is the most developed in terms of information dissemination (Lin, 2007).

The research sample consists of eleven commercial banks, specifically: BH, ATB, BIAT, BNA, UIB, STB, Attijari Bank, BT, UBCI, Amen Bank, and BFT. Our investigation field consists of all eleven banks, and we use the DEA method to measure the

capabilities of each bank. The data are from financial statements and annual reports available in the financial market for 11 years, from 2000 to 2010. The choice of this study period was influenced by two main factors. The first one relates to the significant changes that took place following the new banking reforms. Since 1997, the Central Bank of Tunisia has initiated an upgrading program for financial institutions, particularly banks, with the goal of modernizing the accelerated sector by the year 1999. Thus, the year 1999 was a transition year. The second one is based on the Fraser Institute's assessment of the banking sector. One benefit of choosing a long period is that it can address one of the limitations of studies that have attempted to apply the RBV to the banking sector, namely the low number of years of study (Liu et al., 2010).

3.2. Variables measures

3.2.1. Independent variables measures

- Measures of bank resources: Banking resources are assets used at different levels of the bank (Lamarque, 2001). These resources, also known as inputs, are utilized by the related capabilities for each activity. Researchers who opt for an input-oriented approach use these resource measures as inputs to evaluate bank capability (Zúñiga-Vicente et al., 2004).
- Measures of bank performance: Different measures of operating performance are the ones adopted by the researchers opting for the outputs approach (Roberts and Amit, 2003; Armstrong and Shimizu, 2007; Lin, 2007; Papadopoulos, 2004). These measures adopt many methods: production performance (deposits, credits), revenue performance (interest income, commissions), profit performance, performance in terms of return (ROE), and performance in terms of the risk required (loans or deposits).
- Measures of low-level bank capabilities: The measurement of low-level banking capabilities depends on the input/output approach. Thus, we will establish measures that confront the resource stock levels held vs. operational performance achieved. Researchers generally used the degree of efficiency as a measure for estimating capabilities (Dutta et al., 1999; 2005; Majumdar, 2000; Narasimhan et al., 2006; Nath et al., 2010).
- The low-level bank capabilities can be classified into four types:

- The deposit and operations capability refers to the bank's ability to encourage customers to deposit and manage deposits.
- The credit capability is the bank's ability to encourage customers to grant loans and streamline its credit policy.
- The HRM capability aims to enhance the already achieved NBI (net bank income) level. Thus, this capability improves the overall performance of human resources. Due to the availability of data, the total number of employees, and the total payroll costs, this capability can only manage the remuneration policy and HR investment.
- The bank's financial investment capability requires it to legally remove its primary investment activity and establish companies (SICAV) dedicated to stock market intermediation. This ability does not carry significant weight. However, the existing investment securities on the balance sheet are likely to generate variable income depending on the bank. We encouraged this variance to include the underlying capability in the final model.

- Measure of high-level bank capabilities: The bank's high-level capability is the "Strategic Management Capability" (Lamarque, 2001), which better manages the various low-level bank capabilities. To understand this capability, we consider low-level capabilities as inputs and bank performance as outputs. The latter achieves a dual objective that is appreciated in terms of profitability and risk. Table 1 illustrates the measurement of banking capabilities.
- Measure of the dependent variable (Overall bank performance): There are a variety of criteria to measure bank performance. Roberts and Amit (2003), Boubakri et al. (2005), Wu et al. (2007), Belkhaoui et al. (2012), and Belkhaoui et al. (2014) use ROA. Lin (2007) assessed bank performance by combining Tobin's Q with other measures like MVA and average ROE calculated over five years. The choice of overall performance measurement in this paper considers the Tobin Q as an external criterion that captures long-term performance. The measure of Tobin's Q is complex; we opted for the ratio that best allows its assessment: The Marris ratio (market capitalization/equity). Indeed, Tobin's Q ratio is the ratio between the market value of the companies' assets and their book value. However, due to the impossibility of determining the market value of the bank's assets, we commonly use the grieved ratio.
- Measure of the coherence bank portfolio: The "horizontal coherence" will be assessed through interaction between low-level capabilities.

The "vertical coherence" will be apprehended by the interaction of high-level capability and low-level capabilities. We appreciate interaction as Venkatraman (1989) recommended using standardized variables, which prevents multicollinearity problems.

3.3. Modeling and choice of statistical tools

3.3.1. Estimating bank capabilities using DEA method

In this research, we employed the DEA method to evaluate both low-level and high-level capabilities, with the two-stage DEA being used for the latter. The production approach dictated the choice of inputs and outputs included in the analysis. In general,

researchers studying financial institutions can choose between two distinct approaches: the intermediation approach and the production approach. The production approach posits that a bank's operations and tasks, such as lending and deposit taking, function as inputs and consist of staff and assets. According to the intermediation approach, institutions act as intermediaries to manage financial flows, gathering deposits as inputs and granting loans as outputs to generate profits. Both approaches fall short as they only focus on specific aspects of managing the bank. Choosing one approach over another does not affect unit ranking, according to Wheelock and Wilson (1995). The inputs are defined as the resources used by the decision unit that may affect its performance, while the outputs are the benefits generated from the operations of the decisional unit (Ramanathan, 2003). Using the DEA method necessitates respecting the following conditions:

- According to Ramanathan (2003), the first condition pertains to the homogeneity of the units, in this case, the banks.
- The second condition concerns the number of units, which must be greater than the product of the inputs and outputs (Avkiran, 2001) or at least two times greater than the sum of the inputs and outputs (Ramanathan, 2003).

To estimate efficiency scores, we selected approaches based on optimization orientation, efficiency types, and returns to scale. The input-oriented approach evaluates a bank's efficiency in managing resources by comparing it to other banks with similar output levels. Efficiency is categorized into pure technical, allocative, and scale efficiency. Pure technical efficiency, measured under variable returns to scale (VRS), assesses technology's impact, while scale efficiency is determined by the VRS to constant returns to scale (CRS) ratio, and technical efficiency is evaluated under CRS. This study examines how a bank's capabilities influence resource allocation and utilization, ultimately contributing to overall technical efficiency. Under the assumption of constant returns to scale, efficiency is considered independent of bank size, meaning resource investment levels do not affect efficiency (Ramanathan, 2003). The CCR model, based on this assumption, measures overall technical efficiency. To mitigate autocorrelation issues from estimating scores over the entire study period, we assessed capability levels separately for each year.

3.3.2. The model

Since we will have to deal with a dynamic panel model introducing the lagged dependent variable among endogenous variables, the model to be tested can be formulated as follows:

$$PERF_{it} = ai + a1.PERF_{i,t-n} + a2.(CapBN_{it}) + a3.CMO_{it} + a4.(CapHN_{it}) + a5.(CapHN_{it-n}) + E_{it}$$

where, i represents bank i and t denotes year t. $PERF_{i,t-n}$ refers to lagged bank performance. $CapHN_{it}$ represents high-Level bank capability. $CapBN_{it-n}$ indicates the lagged high-level bank capability. Whereas $CapBN_{it}$ corresponds to low-level bank capability. The interaction term for coherence and high-level bank capability is denoted CMO_{it}. The parameter n specifies the number of lags, and E_{it} represents the error term.

3.3.3. GMM estimation of the model

The review of previous empirical studies revealed that studies on a dynamic panel would highlight the causal relationship and their sustainability (Morgan et al., 2006; Jeffers et al., 2008). We chose a dynamic panel regression method to isolate the specific effects of banking capabilities on the overall performance (Greene, 2000).

Table 1: Inputs/ output measures of bank capabilities

Bank capabilities	Inputs: Bank resources	References	Outputs: Bank operational performances	References
CCE: The deposit and operations capability	The number of enforcement staff The number of managerial staff	Mukherjee et al. (2002)	The amount of deposits	Staub et al. (2010)
	The number of branches.	Chen and Yeh (1998)	Commissions on banking operations	Oral and Yolalan (1990)
CCR: The credit capability	accrued interest	Staub et al. (2010)	The amount of credits	Havrylchyk (2006); Staub et al. (2010)
	The number of branches.	Chen and Yeh (1998)	The amount of revenue on credit	Chen and Yeh (1998)
CPF: The financial investment capability	Financial investment*	Chen (2012)	Investment income	Rogers (1998)
CRH: The HRM capability	The total payroll Number of employees	Staub et al. (2010) Favero and Papi (1995)	Net banking income	Lamarque and Maurer (2009)
CMS: Strategic management capability	CCE, CCR, CRH and CPF		Le Résultat net/Capitaux propres equity /total assets**	Sakar (2006) Chen (2012)

*: The investment was used in most studies, adopting a production approach, as output (Chen, 2012). In our case we seek to assess the bank's investment capability that enables it to manage the funds allocated to investments to improve profitability; **: This ratio has been proposed by Chen (2012) as input to account for the in-process risk when evaluating the bank efficiency, but in our case we use this ratio as output since according to the recommendations of Basel II the bank must adopt as, among others, aims at improving the level of risk

Arellano and Bond (1991) proposed the Generalized Method of Moments (GMM) to estimate dynamic panel data models due to the endogenous nature of the independent variable. The GMM estimator operates on first differences, allowing for the removal of individual fixed effects. This method uses as dummies the lagged values of endogenous variables and eventually those of other independent variables. STATA 10 allows the choice between two options: A regression on first differences (Arellano and Bond, 1991) and a second based on equation systems; the latter is preferred (more efficient) than the former (Blundell and Bond, 1998). Blundell and Bond (1998) proposed the GMM system method to address various partial sources of bias, incorporating the independent variable lags and lagged differences as test instruments. Thus, GMM allows the estimation of dynamic models with independent variables "potentially endogenous" (Arellano, 2003).

The validity tests of the lagged variables, such as the over-identification tests (Sargan, 1958; Hansen, 1982) and the determination of the absence of the second-order autocorrelation of errors (Arrellano and Bond, 1991), determine the quality of the model specification.

The Generalized Moments Method stipulates the orthogonality conditions between the lagged variables and the error term, both in terms of first difference and level. When the dynamic model is expressed in I (1), the instruments are in I (0), and vice versa. In the model to be estimated, the usage of lagged variables as instruments varies according to the nature of the explanatory variables. For exogenous variables, their current values are used as instruments. For predetermined or weakly exogenous variables, their lagged values of at least one period can be used as instruments. For endogenous variables, their lagged values of two or more periods can be valid instruments. The good instruments retained must be validated by Sargan/Hansen tests.

The first difference Generalized Moments Method estimator of Arellano and Bond (1991) involves using for each period the I (1) of the equation to be estimated to remove the individual specific effects (Yahyaoui et al., 2021). Thus, we get:

$$\Delta y_{it} = \alpha \Delta y_{it-1} + \beta \Delta X_{it} + \Delta \varepsilon_{it}$$

where, y_{it}, is the dependent variable for individual i at time t. α is the coefficient associated with the lagged dependent variable. X_{it} is independent variable(s) (explanatory variable(s)) for individual i at time t. ε_{it} is the error term for individual i at time t.

It is, thus, a matter of utilizing the lagged endogenous variable through its prior values spanning four periods or more. This method fails to identify the impact of invariant components over time. The GMM system estimator introduced by Blundell and Bond (1998) integrates first difference equations with level equations. The variables in the initial difference equation are shown in their level form, and conversely.

$$\begin{cases} \Delta y_{it} = \alpha \Delta y_{it-1} + \beta \Delta X_{it} + \Delta \varepsilon_{it} \\ y_{it} = \alpha y_{it-1} + \beta x_{it} + \mu_i + \varepsilon_{it} \end{cases}$$

where, μ is the individual-specific fixed effect, which is removed in the first-difference transformation

4. Results and discussion

The multicollinearity test (the test will be repeated after adding more variables to the model) between the model variables has led to a good VIF (variance inflation factor) with all variables having a VIF of less than 10, which means that all variables will stay in the final model (Chatterjee et al., 2000). Additionally, the Levin-Chu-Lin test does not detect a stationarity problem for any of the variables at the 1% and 5% levels. We opted for a robust regression that corrects this bias by using the white method to account for the heteroscedasticity problem. The estimation of the model requires adding instrumental variables. Thus, we add delayed performance and strategic management capability as independent variables. Results show a significant effect for these instruments (2 periods for high-level capability and 3 periods for performance were allocated in terms of lag times). Results given in Table 2 were robust enough for the significance of the first errors of autocorrelation tests and second order (Arellano-Bond tests) and tests relating to compliance restrictions on identification (Sargan/Hansen tests). Low-level capabilities and bank performance: Estimating the model without the "delayed performance" variable allowed the emergence of three low-level capabilities that significantly affected performance: Deposit and operations capability, financial investment capability, and credit capability. While the third capability has a negative relationship with performance, the first two capabilities yield positive outcomes. These results confirm hypothesis H1 for two types of low-level capabilities. High-level capability and bank performance: The strategic management capability influences significantly the performance (α=0.002%). The outcome validates hypothesis H2, which asserts a positive correlation between high-level capability and bank performance.

Thus, the ability of the banks to combine their various capabilities to meet the dual objectives of profitability and risk management primarily explains their performance. Horizontal coherence and bank performance: The inter-interaction capabilities have a significant and positive effect on banking performance (α=3.2%). This result confirms hypothesis H3, which states that coherence ("horizontal") between the low-level capabilities significantly and positively affects the bank's performance. Vertical coherence and bank performance: Results show that the interaction between low and high-level capabilities has no significant effect on bank performance.

Table 2: Model estimations results

	Dynamic model 1	Dynamic model 2	Dynamic model 3	Fixed effect model	Random effect model
QTOBIN (-1)	.493***	.514***	.494***		
	(.165)	(.159)	(.164)		
QTOBIN (-2)	.661*	.706**	.661*		
	(.341)	(.351)	(.343)		
QTOBIN (-3)	-.106	.001	-.104		
	(.331)	(.314)	(.321)		
C	.141	.669	.132	-.641	-.225
	(1.031)	(.882)	(1.088)	(.462)	(.324)
CCE	.111	.156	.105	1.027**	.715 **
	(.471)	(.500)	(.471)	(.423)	(.301)
CCR	-1.024	-1.432*	-1.025	-.050 ***	-.043***
	(.823)	(.779)	(.854)	(.017)	(.014)
CRH	.843	.589	.855	.271	.211
	(.537)	(.403)	(.560)	(.381)	(.362)
CPF	.157	-.186	.156	1.161***	1.034***
	(.316)	(.335)	(.323)	(.232)	(.221)
CMS	.067***	.059***	.068 ***	.031	.036
	(.021)	(.023)	(.022)	(.027)	(.024)
CPF x CRH[1]		.098**			
		(.045)			
CCE x CRH					
CCR x CMS[1]			.024		
			(.147)		
Hausman test (Hausman, 1978)				0.032 < 10% → Fixed effect	
P (Wald Chi2[2]/Fisher)	0.000	0.000	0.000	0.000	0.000
Arellano-Bond (AR1)	0.079	0.072	0.076		
Arellano-Bond (AR2)	0.106	0.912	0.108		
Sargan	0.199	0.219	0.204		

*: p<10%; **: p<5%; ***: p<1%; The values in parentheses correspond to the standard errors corrected for the heteroscedasticity; The values of the tests correspond to the P-values for the rejection of the null hypothesis; The models that have presented a none conclusive tests of specificity were omitted; [1]: The interaction is measured from the product of the variables standardized

"Financial investment capability" and "deposit and operations capability" are the only low-level banking capabilities that positively affect individual bank performance. This result corroborates previous studies (Lamarque, 2001; Blazevic and Lievens, 2004; Coltman, 2007).

Bank performance positively correlates with high-level capability, or "strategic management capability." This result corroborates earlier studies (Lamarque, 2001; Grewal and Slotegraaf, 2007). This capability plays a leading role in the performance and shareholder value-generating process. This consequence happens through a favorable balance between strengthening the low-level capabilities portfolio, improving profitability, and managing bank risk. Combinative dynamic capability, especially the coordination capability type (Joglar and Chaparro, 2007; Chou, 2011), which is based on bank processes and mechanisms, played a big role in high-level capability effects.

Regarding horizontal coherence, the results underscore the pure moderating role (Venkatraman, 1989) of HRM capability in relation to financial investment capabilities and bank performance. This result confirms the findings of earlier studies (Fedor et al., 2006; Shum et al., 2008; Yang, 2012) and strengthens the argument for the significance of human capital efficiency capability (Alhassan and Asare, 2016) in enhancing bank productivity (Kuchciak and Warwas, 2021).

As one of the few types of research that uses a resource-based approach to explain banking performance in a developing country, it is crucial to emphasize the value of this work.

For professionals in the banking sector, this work identifies the key capabilities that deserve more attention when developing strategies aligned with the interplay of internal and external factors (Alfadli and Rjoub, 2020; Jeris, 2021) to ensure superior and sustainable performance of banks in emerging countries.

Bank managers must develop their strategic orientation when dealing with investment in human resources as well as financial placement capabilities. Based on our results, it seems obvious that banks need to focus on their functional capabilities as a priority more than on bank operational capabilities. Training and development of bank employees, particularly in HRM excellent practices, is a critical factor in banking performance (Huynh et al., 2020). HR investment enhances bank employees' abilities to address sector challenges (Kuchciak and Warwas, 2021) and improves their productivity for a better future customer relationship, especially in an emergent market (Jeni and Al-Amin, 2021). However, to be more effective, managers must implement these developments in bank capabilities with respect to the need for alignment with changes in external environmental factors (Alfadli and Rjoub, 2020; Jeris, 2021).

5. Conclusion

This research examines the correlation between bank capabilities and performance, as well as the relationship between the capabilities' portfolio and performance. The study uses several statistical tools, like the DEA method and the GMM. The literature review allowed us to identify a typology of banking capabilities and to develop research hypotheses. The Tunisian banking sector validates the empirical study from 2000 to 2010.

This work allowed testing empirically, in the case of banking, the assertion of the resource-based theory on the role of capabilities in explaining firm performance. The model's estimation revealed an impact of individual capabilities, while others played a purely moderating role in determining banking performance. The results lead to the conclusion that relationships could exist even within a banking capabilities portfolio.

The study of the intra-portfolio relationship has assigned various roles to certain capabilities, both individually and collectively, as suggested by Dutta et al. (1999). This suggests that the value of an asset is closely linked to the level of other assets.

The study has the merit of highlighting the importance of internal factors on bank performance, particularly the bank's capabilities in an emerging market. This result needs to be confirmed in other emerging contexts since it emphasizes investing not only in operational capabilities but also in a combination of functional capabilities. Particularly the HR capabilities that need to be invested in to address the challenge of digitalization and product innovation (Kuchciak and Warwas, 2021) faced by most emerging markets.

This study possesses limitations. The initial aspect pertains to the sample size dictated by the population size of the listed commercial banks in the country. The second limitation is the inherent weakness of any singular sector analysis, which complicates the extrapolation of findings to the entirety of the economy. The third limitation pertains to the measures utilized to evaluate banking capabilities, which are limited by the availability of data.

This study recommends the use of a multi-country sample in future research to enhance the generalization of results, as the measures employed are easily replicable in various studies and contexts. Finally, it is noteworthy that certain analysis tools within game theory and simulation can significantly contribute to the development of empirical research in resource-based theory.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Alfadli A and Rjoub H (2020). The impacts of bank-specific, industry-specific and macroeconomic variables on commercial bank financial performance: Evidence from the Gulf Cooperation Council countries. Applied Economics Letters, 27(15): 1284-1288. https://doi.org/10.1080/13504851.2019.1676870

Alhassan AL and Asare N (2016). Intellectual capital and bank productivity in emerging markets: Evidence from Ghana. Management Decision, 54(3): 589-609. https://doi.org/10.1108/MD-01-2015-0025

Arellano M (2003). Panel data econometrics. Volume 231, Oxford University Press, Oxford, UK. https://doi.org/10.1093/0199245282.001.0001

Arellano M and Bond S (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The Review of Economic Studies, 58(2): 277-297. https://doi.org/10.2307/2297968

Arellano M and Bover O (1995). Another look at the instrumental variable estimation of error-components models. Journal of Econometrics, 68(1): 29-51. https://doi.org/10.1016/0304-4076(94)01642-D

Armstrong CE and Shimizu K (2007). A review of approaches to empirical research on the resource-based view of the firm. Journal of Management, 33(6): 959-986. https://doi.org/10.1177/0149206307307645

Avkiran NK (2001). Investigating technical and scale efficiencies of Australian universities through data envelopment analysis. Socio-Economic Planning Sciences, 35(1): 57-80. https://doi.org/10.1016/S0038-0121(00)00010-0

Belkhaoui S, Lakhal L, and Hellara S (2012). Impact de la structure de marché et du choix stratégique sur la performance bancaire: Cas des pays émergents. Management International, 16(4): 129-149. https://doi.org/10.7202/1013154ar

Belkhaoui S, Lakhal L, Lakhal F, and Hellara S (2014). Market structure, strategic choices and bank performance: A path model. Managerial Finance, 40(6): 538-564. https://doi.org/10.1108/MF-07-2013-0183

Blazevic V and Lievens A (2004). Learning during the new financial service innovation process: Antecedents and performance effects. Journal of Business Research, 57(4): 374-391. https://doi.org/10.1016/S0148-2963(02)00272-2

Blundell R and Bond S (1998). Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics, 87(1): 115-143. https://doi.org/10.1016/S0304-4076(98)00009-8

Boubakri N, Cosset JC, Fischer K, and Guedhami O (2005). Privatization and bank performance in developing countries. Journal of Banking and Finance, 29(8-9): 2015-2041. https://doi.org/10.1016/j.jbankfin.2005.03.003

Castanias RP and Helfat CE (1991). Managerial resources and rents. Journal of Management, 17(1): 155-171. https://doi.org/10.1177/014920639101700110

Castanias RP and Helfat CE (2001). The managerial rents model: Theory and empirical analysis. Journal of Management, 27(6): 661-678. https://doi.org/10.1177/014920630102700604

Chatterjee S, Hadi AS, and Price B (2000). Regression analysis by examples. 3rd Edition, Wiley, New York, USA.

Chen KH (2012). Incorporating risk input into the analysis of bank productivity: Application to the Taiwanese banking industry. Journal of Banking and Finance, 36(7): 1911-1927. https://doi.org/10.1016/j.jbankfin.2012.02.012

Chen TY and Yeh TL (1998). A study of efficiency evaluation in Taiwan's banks. International Journal of Service Industry Management, 9(5): 402-415. https://doi.org/10.1108/09564239810238820

Chou TC (2011). Exploring call center-enabled organizational mechanisms associated with combinative capabilities. Management Decision, 49(6): 841-859. https://doi.org/10.1108/00251741111143577

Collis DJ (1994). Research note: How valuable are organizational capabilities? Strategic Management Journal, 15(S1): 143-152. https://doi.org/10.1002/smj.4250150910

Coltman T (2007). Can superior CRM capabilities improve performance in banking. Journal of Financial Services Marketing, 12: 102-114. https://doi.org/10.1057/palgrave.fsm.4760065

Domanović V, Todorović V, and Savović S (2018). Internal factors of bank profitability in the Republic of Serbia. Business and Economic Horizons, 14(3): 659-673. https://doi.org/10.15208/beh.2018.46

Dutta S, Narasimhan O, and Rajiv S (1999). Success in high-technology markets: Is marketing capability critical? Marketing Science, 18(4): 547-568. https://doi.org/10.1287/mksc.18.4.547

Dutta S, Narasimhan OM, and Rajiv S (2005). Conceptualizing and measuring capabilities: Methodology and empirical application. Strategic Management Journal, 26(3): 277-285. https://doi.org/10.1002/smj.442

Favero CA and Papi L (1995). Technical efficiency and scale efficiency in the Italian banking sector: A non-parametric approach. Applied Economics, 27(4): 385-395. https://doi.org/10.1080/00036849500000123

Fedor DB, Caldwell S, and Herold DM (2006). The effects of organizational changes on employee commitment: A multilevel investigation. Personnel Psychology, 59(1): 1-29. https://doi.org/10.1111/j.1744-6570.2006.00852.x

Greene WH (2000). Econometric analysis. 4th Edition, Prentice Hall, Englewood Cliffs, USA.

Grewal R and Slotegraaf RJ (2007). Embeddedness of organizational capabilities. Decision Sciences, 38(3): 451-488. https://doi.org/10.1111/j.1540-5915.2007.00166.x

Gupta N and Mahakud J (2020). Ownership, bank size, capitalization and bank performance: Evidence from India. Cogent Economics and Finance, 8(1): 1808282. https://doi.org/10.1080/23322039.2020.1808282

Hansen LP (1982). Large sample properties of generalized method of moments estimators. Econometrica: Journal of the Econometric Society, 50(4): 1029-1054. https://doi.org/10.2307/1912775

Hausman JA (1978). Specification tests in econometrics. Econometrica: Journal of the Econometric Society, 46(6): 1251-1271. https://doi.org/10.2307/1913827

Havrylchyk O (2006). Efficiency of the Polish banking industry: Foreign versus domestic banks. Journal of Banking and Finance, 30(7): 1975-1996. https://doi.org/10.1016/j.jbankfin.2005.07.009

Heiens RA, Leach RT, and McGrath LC (2007). The contribution of intangible assets and expenditures to shareholder value. Journal of Strategic Marketing, 15(2-3): 149-159. https://doi.org/10.1080/09652540701319011

Huynh QT and Huynh T (2020). Comparative significance of human resource management practices on banking financial performance with analytic hierarchy process. Accounting, 6(7): 1323-1328. https://doi.org/10.5267/j.ac.2020.8.018

Jarvenpaa SL and Leidner DE (1998). An information company in Mexico: Extending the resource-based view of the firm to a developing country context. Information Systems Research, 9(4): 342-361. https://doi.org/10.1287/isre.9.4.342

Jeffers PI, Muhanna WA, and Nault BR (2008). Information technology and process performance: An empirical investigation of the interaction between IT and non-IT resources. Decision Sciences, 39(4): 703-735. https://doi.org/10.1111/j.1540-5915.2008.00209.x

Jeni FA and Al-Amin M (2021). The impact of training and development on employee performance and productivity: An empirical study on private banks in the Noakhali region of Bangladesh. South Asian Journal of Social Studies and Economics, 9(2): 1-18. https://doi.org/10.9734/sajsse/2021/v9i230234

Jeris SS (2021). Factors influencing bank profitability in a developing economy: Panel evidence from Bangladesh. International Journal of Asian Business and Information Management, 12(3): 333-346. https://doi.org/10.4018/IJABIM.20210701.oa20

Joglar H and Chaparro J (2007). Valuing IS/IT resources as an antecedent of absorptive capacity: An RBV perspective. Issues in Informing Science and Information Technology, 4: 445-459. https://doi.org/10.28945/963

Kuchciak I and Warwas I (2021). Designing a roadmap for human resource management in the banking 4.0. Journal of Risk and Financial Management, 14(12): 615. https://doi.org/10.3390/jrfm14120615

Lamarque E (1999). Les activités clés des métiers bancaires: Une analyse par la chaîne de valeur. Finance Contrôle Stratégie, 2(2): 135-160.

Lamarque E (2001). Avantage concurrentiel et compétences clés: Expérience d'une recherche sur le secteur bancaire. Finance Contrôle Stratégie, 4(1): 63-88.

Lamarque É and Maurer F (2009). Le risque opérationnel bancaire: Dispositif d'évaluation et système de pilotage. Revue Française de Gestion, 191(1): 93-108. https://doi.org/10.3166/rfg.191.93-108

Lin BW (2007). Information technology capability and value creation: Evidence from the US banking industry. Technology in Society, 29(1): 93-106. https://doi.org/10.1016/j.techsoc.2006.10.003

Liu L, Timothy V, and Gao Y (2010). A review of approaches of resource-based empirical research in banking. The International Journal of Applied Economics and Finance, 4(4): 230-241. https://doi.org/10.3923/ijaef.2010.230.241

Majumdar SK (2000). Sluggish giants, sticky cultures, and dynamic capability transformation. Journal of Business Venturing, 15(1): 59-78. https://doi.org/10.1016/S0883-9026(98)00010-X

Makhija M (2003). Comparing the resource-based and market-based views of the firm: Empirical evidence from Czech privatization. Strategic Management Journal, 24(5): 433-451. https://doi.org/10.1002/smj.304

Mintzberg H (1986). Le pouvoir dans les organizations. Les Editions d'Organization, Paris, France.

Morgan NA, Vorhies DW, and Schlegelmilch BB (2006). Resource–performance relationships in industrial export ventures: The role of resource inimitability and substitutability. Industrial Marketing Management, 35(5): 621-633. https://doi.org/10.1016/j.indmarman.2005.05.018

Mukherjee A, Nath P, and Pal MN (2002). Performance benchmarking and strategic homogeneity of Indian banks. International Journal of Bank Marketing, 20(3): 122-139. https://doi.org/10.1108/02652320210430965

Narasimhan O, Rajiv S, and Dutta S (2006). Absorptive capacity in high-technology markets: The competitive advantage of the haves. Marketing Science, 25(5): 510-524. https://doi.org/10.1287/mksc.1060.0219

Nath P, Nachiappan S, and Ramanathan R (2010). The impact of marketing capability, operations capability and diversification strategy on performance: A resource-based view. Industrial Marketing Management, 39(2): 317-329. https://doi.org/10.1016/j.indmarman.2008.09.001

Oral M and Yolalan R (1990). An empirical study on measuring operating efficiency and profitability of bank branches. European Journal of Operational Research, 46(3): 282-294. https://doi.org/10.1016/0377-2217(90)90002-S

Panwar A, Olfati M, Pant M, and Snasel V (2022). A review on the 40 years of existence of data envelopment analysis models: Historic development and current trends. Archives of Computational Methods in Engineering, 29(7): 5397-5426. https://doi.org/10.1007/s11831-022-09770-3 **PMid:35702633 PMCid:PMC9184254**

Papadopoulos S (2004). Market structure, performance and efficiency in European banking. International Journal of Commerce and Management, 14(1): 79-100. https://doi.org/10.1108/10569210480000175

Priem RL and Butler JE (2001). Is the resource-based "view" a useful perspective for strategic management research? Academy of Management Review, 26(1): 22-40. https://doi.org/10.5465/amr.2001.4011928

Ramanathan R (2003). An introduction to data envelopment analysis: A tool for performance measurement. SAGE Publications, New Delhi, India.

Roberts PW and Amit R (2003). The dynamics of innovative activity and competitive advantage: The case of Australian retail banking, 1981 to 1995. Organization Science, 14(2): 107-122. https://doi.org/10.1287/orsc.14.2.107.14990

Rogers KE (1998). Nontraditional activities and the efficiency of US commercial banks. Journal of Banking and Finance, 22(4): 467-482. https://doi.org/10.1016/S0378-4266(98)00020-X

Saa-Perez PD and Garcia-Falcon JM (2002). A resource-based view of human resource management and organizational capabilities development. International Journal of Human Resource Management, 13(1): 123-140. https://doi.org/10.1080/09585190110092848

Sakar B (2006). A study on efficiency and productivity of Turkish banks in Istanbul stock exchange using Malmquist DEA. Journal of American Academy of Business, 8(2): 145-155.

Sargan JD (1958). The estimation of economic relationships using instrumental variables. Econometrica: Journal of the Econometric Society, 26(3): 393-415. https://doi.org/10.2307/1907619

Shum P, Bove L, and Auh S (2008). Employees' affective commitment to change: The key to successful CRM implementation. European Journal of Marketing, 42(11/12): 1346-1371. https://doi.org/10.1108/03090560810903709

Staub RB, Souza GDS, and Tabak BM (2010). Evolution of bank efficiency in Brazil: A DEA approach. European Journal of Operational Research, 202(1): 204-213. https://doi.org/10.1016/j.ejor.2009.04.025

Venkatraman N (1989). The concept of fit in strategy research: Toward verbal and statistical correspondence. Academy of Management Review, 14(3): 423-444. https://doi.org/10.2307/258177

Wang W, Huang J, Wang H, and Alidaee B (2022). Internal and external analysis of community banks' performance. International Review of Financial Analysis, 84: 102409. https://doi.org/10.1016/j.irfa.2022.102409

Wheelock DC and Wilson PW (1995). Explaining bank failures: Deposit insurance, regulation, and efficiency. The Review of Economics and Statistics, 77(4): 689-700. https://doi.org/10.2307/2109816

Wu HL, Chen CH, and Lin MH (2007). The effect of foreign bank entry on the operational performance of commercial banks in the Chinese transitional economy. Post-Communist Economies, 19(3): 343-357. https://doi.org/10.1080/14631370701504404

Yahyaoui A, Samet K, and Amirat A (2021). Examining the financial development–economic growth nexus from an institutional approach: Evidence from non-oil Arab countries. Asian Economic and Financial Review, 11(6): 457-470. https://doi.org/10.18488/journal.aefr.2021.116.457.470

Yang YF (2012). Service capabilities and customer relationship management: An investigation of the banks in Taiwan. The Service Industries Journal, 32(6): 937-960. https://doi.org/10.1080/02642069.2010.545394

Zubir MZ, Noor AA, Mohd Rizal AM, Harith AA, Abas MI, Zakaria Z, and A Bakar AF (2024). Approach in inputs and outputs selection of data envelopment analysis (DEA) efficiency measurement in hospitals: A systematic review. PLOS ONE, 19(8): e0293694. https://doi.org/10.1371/journal.pone.0293694 **PMid:39141630 PMCid:PMC11324144**

Zúñiga-Vicente JÁ, de la Fuente-Sabaté JM, and González IS (2004). Dynamics of the strategic group membership–performance linkage in rapidly changing environments. Journal of Business Research, 57(12): 1378-1390. https://doi.org/10.1016/S0148-2963(03)00071-7