https://doi.org/10.15407/economyukr.2025.04.032
JEL: F4, G1, G2, O5

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DETERMINANTS OF BANKING SECTOR DEVELOPMENT: EVIDENCE FROM ARAB MAGHREB COUNTRIES

This study measures the development of the banking sector in the Arabe Maghreb countries and highlights its determinants using the dynamic panel model GMM. It uses four indicators (efficiency, depth, stability) for 2006-2023, covering 24 commercial banks (public and private). Key findings include: institutional quality, legal environment, and governance enhance the banking sector, while inflation and democracy hinder it.

***Keywords**: Banking efficiency; Data Envelopment Analysis (DEA); Banking sector development; Dynamic panel model GMM.*

C i t a t i o n: Dahmane, M.A., Bettioui, N., Bendob, A. (2025). Determinants of banking sector development: evidence from Arab Maghreb countries. *Economy of Ukraine. 68.* 04 (761). 32-49. https://doi.org/10.15407/economyukr.2025.04.032

In the current phase, the global economy has witnessed numerous changes and developments resulting from globalization and openness, which have led to the liberalization of banks and financial markets, escalated utilization of contemporary and sophisticated financial tools, together with the offering of novel financial items and services. This has resulted in an increase in financial transactions and competition, reflecting these developments and transformations in the banking sector and increasing its utilization of contemporary information and communication technology, which raises the level of development in the financial industry.

Numerous scholars have investigated the factors contributing to the disparities in the growth of the banking industry across different nations. They argue that the differences are due to several indicators, including: institutional quality index (Khan et al., 2019), legal environment (Raza et al., 2014), legal assets and traditions (Beck, Levine, 2005), openness to trade and capital (Touny, 2014), economic growth (Botev et al., 2019), inflation (Akçay, 2019), income level (Jauch, Watzka, 2016), political institutions (democracy) (Yang, 2011), religion, language, and culture (Stulz, Williamson, 2003), and geographical endowments (Yongfu, 2010). Therefore, it is crucial to determine the elements that promote the expansion of the banking sector, since advanced banking sectors possess a higher ability to alleviate financial limitations, enhance the reduction of poverty, foster greater competition among institutions, and stimulate economic growth in comparison to underdeveloped banking sectors.

Although a thorough investigation was carried out to look at how the banking sector's growth affected economic growth, not much research has been done to determine the factors influencing the banking sector's expansion and development.

Accordingly, the three Maghreb countries (Algeria, Morocco, and Tunisia) are of interest because they remain underdeveloped despite reforms, which have led to the underdevelopment of most of their banking sectors. In addition, their depth, efficiency, and stability indices exhibit lower values when compared to those of other Arab nations.

The problem of this study can be formulated in the following main question: To what extent has the banking sector developed in the Maghreb countries (Algeria, Morocco, and Tunisia) during the period (2006-2023)?

STUDY HYPOTHESIS

The basic hypothesis that this study is based on is as follows:

• the institutional quality index measures the quality of the legal environment, and governance are determinants that significantly enhance the evolution of the banking industry in the Maghreb nations (Algeria, Morocco, and Tunisia), while inflation rate and democracy hinder the development of this sector;

• there is a distinct disparity in the degrees of banking sector development among the Maghreb nations (Algeria, Morocco, and Tunisia).

Purpose of this article is:

• using the Data Envelopment Analysis (DEA) technique to gauge the banking industry's efficiency in the Maghreb countries (Algeria, Morocco, Tunisia) according to the VRS model;

• constructing a composite index that includes three indicators (efficiency, depth, and stability) to compute, using the PCA approach, the degree of development of the banking sector;

• analyzing the main factors that influence the banking industry's growth, both from inside the industry and from external sources in the Maghreb countries (Algeria, Morocco, and Tunisia) during the study period.

O. Aluko & M. Ajayi (2018) intend to examine the elements that impacted the banking industry's expansion in South African nations between 1997 and 2014, by utilizing the Panel GMM model and data from 25 Sub-Saharan African countries. The study concluded with the subsequent findings: the growth and success of the banking sector are positively influenced by factors such as human capital, commercial openness, and population density. However, the process is impeded by financial liberalization. Furthermore, the effectiveness of the banking industry is improved by legal and inflationary factors, as well as by religious influences.

The study conducted by M. Khan et al. (2019). The objective was to investigate the correlation between the degree of advancement and the institutional quality of the financial sector. in the United States. The researchers employed the ARDL model and examined data from the years 1984 to 2016, focusing on nine comprehensive indicators identified by the International Monetary Fund. The primary findings of the investigation suggest that the quality of an institution has a direct, lasting, and favorable impact on financial progress.

E. Čižo et al. (2020) sought to emphasize the factors inside and outside European Union nations that influence the progress of their financial sector, as assessed by financial depth, stability, and emerging market growth, from 1995 to 2023. The study's findings may be summarized as follows: Financial liberalization and trade openness positively influence financial growth by improving the allocation of resources. The legal system index, which consists of measures of judicial expansion of the financial and banking industry, is positively associated with independence and the preservation of property rights.

C.-Q. Song et al. (2021) carried out a thorough investigation on the connection between financial development and economic expansion, and corruption across 142 nations. This study included 124 developing countries, such as Algeria, Morocco, and Tunisia, as well as 18 industrialized countries. The study analyzed data from the years 2002 to 2016 using the Panel ECM model to investigate the long-term patterns. The investigation reached the following conclusion: Financial development and corruption are causally related, as are financial development and continuous economic growth. The findings suggest a direct correlation between economic expansion and the advancement of banking institutions in Algeria and Morocco. In contrast, corruption negatively impacts the development of banks.

Study by K. Gwachha (2023) aims to examine the bank-specific factors and banking sector development in Nepal by using the ARDL approach technique with economic time series data ranging from 1995 to 2020. The study depends on

the co-integration analysis to find out the long-run equilibrium relationship among the variables of the model. This study reveals that banking trade has positive and significant influenced the banking sector development in line with Theoretical predictions. Electronic banking and liquidity have a positive and statistically significant role to explain banking sector development in Nepal. In addition, it demonstrates that non-performing loans has a negatively and significantly influenced banking sector development.

In the study by M. Pahlavani et al. (2024), the effect of oil revenue governance on the economic growth of selected OPEC member countries was investigated, with an emphasis on the development of the banking sector, using the PVAR GMM method. For this purpose, the database of selected OPEC member countries from 2003 to 2022, and STATA software was used to analyze the data. Results showed that: the governance indicators of oil revenues and banking sector development indicators have a positive effect on economic growth. Also, oil revenues have had a significant positive effect on economic growth.

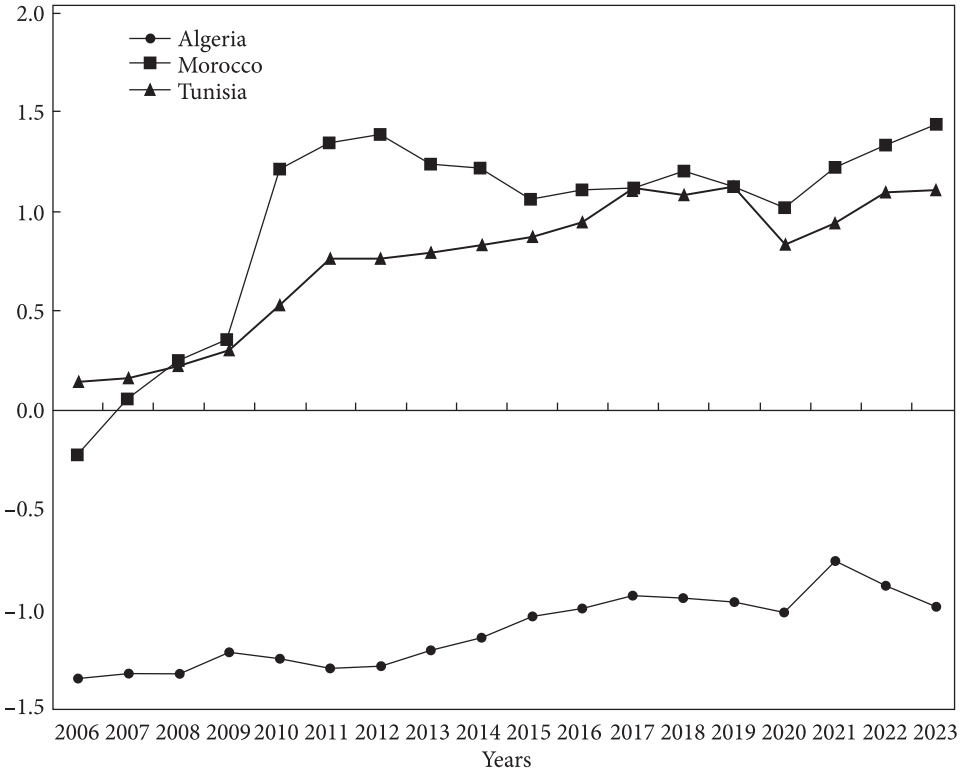
METHODOLOGY

Study Sample. This study examines the determinants that impact the expansion and advancement of the banking sector in the Maghreb countries, namely Algeria, Morocco, and Tunisia, from 2006 to 2023. It focuses on both internal and external factors. The sample consists of 24 commercial banks (both public and private), and the study employs the dynamic panel model GMM Panel Dynamic. Four models will be estimated for each indicator. There is no text provided. The initial model will evaluate the effects of external and internal variables on the efficiency of banking. The second model will focus on measuring the extent of financial depth. The third model will assess the stability of banking institutions. There is no text provided. Finally, the fourth model will assess the composite index of banking development.

Study Model. The model incorporates control variables to address variations in banking sector growth between nations, specifically linked to governance, income level, and democracy. The dynamic panel model is represented as follows:

$$\begin{gathered} BSD_{it} = \alpha + \beta_1 BSD_{it-1} + \beta_2 \text{ Institutional Quality}_{it} + \\ + \beta_3 \text{ Legal System}_{it} + \beta_4 \text{ Trade Openness}_{it} + \beta_5 \text{ GDP Growth}_{it} + \\ + \beta_6 \text{ Inflation}_{it} + \beta_7 \text{ Government Size}_{it} + \beta_8 \text{ Income Level}_{it} + \\ + \beta_9 \text{ Democracy}_{it} + \mu_i + \varepsilon_{it}, \end{gathered}$$

where BSD represents the banking sector development index, which is quantified using a composite indicator; the symbol μ represents the unobservable country-specific effect, while ε_t represents the error term; both *i* and *t* relate to the nation and the time period, respectively. The effectiveness of the Model 1 was evaluated using technical efficiency ratings obtained using the DEA method. The study relied on the mediation approach and the input orientation consisting of one input,



Development the Composite Index of Banking Sector Development in the Arabe Maghreb countries

Table 1. **Summary Statistics of the First Principal Components (BSD Index)**

Variables	Eigenvalues	Difference	Proportion	Cumulative Value	Variance
PTE	1.9148	0.91586	0.6383	0.6383	1.00003
CPS	0.99893	0.91267	0.3330	0.9712	1
Z-score	0.08626	—	0.0288	1.0000	0.99997

Source: Compiled by the authors using Stata 16 output.

which is total deposits, and two outputs, which are loans and non-interest income for the banks in the study sample.

The financial depth in Model 2 was evaluated by considering the extent of loans extended to the private sector. The *Z*-score was included in Model 3 to evaluate the finance system's stability. The finance system's prosperity was evaluated in Model 4 using a composite index that measured efficiency, depth, and stability. The results are shown in Table 1.

Composite Index of Banking Sector Development. The following Figure the banking sector in the Maghreb countries continues to be characterized by the significant contribution of the public sector, albeit to varying degrees. This dominance also extends to the operations, activities, and management of banks, which

has had a noticeable impact on their operations and strategies, particularly in Algeria and Tunisia, and to a lesser extent in Morocco. This is evident from the low levels of credit directed to the private sector, as well as fluctuations in the development of financial depth indicators and the unclear impact of financial liberalization policies. In contrast, Morocco has experienced steady growth and improvement across all financial indicators, underscoring the relative success of financial reforms and liberalization policies in developing and enhancing the Moroccan banking sector.

Definition of Variables and Data Sources. The Table 2 is a concise overview of the main research variables along with the data sources used.

Table 2. **Study Variables and Data Sources**

Variables	Definition of the variable	Source
Efficiency	Pur technical efficiency (VRS)	Data, Envelopment, Analysis
Stability	Bank *Z*-score respectively	Federal Reserve, Economic Data
Financial depth	Private credit to GDP	Knoema Atlas
Banking Secteur Development	Composite index, efficiency, depth and stability	Principale, Component Analysis
Institutional Quality	Indicators namely: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption	World Governance Indicators
Legal system	Judicial independence, impartial courts, intellectual property protection, military interference in the rule of law, and integrity of the legal system	Property, Rights, Index
Trade Openness	The ratio of the imports plus exports to GDP	World Development Indicators
Economic growth	It was measured by GDP growth rate	World Development Indicators
Inflation	Average consumer price inde	World Development Indicators
Income level	Winitial GDP per capita, taken in natural logarithm (ln)	Knoema Atlas
Government	The ratio of government expenditure to GDP	Knoema Atlas

Source: compiled by the authors based on previous studies.

A priori expectation. Based on previous studies, the relationships between internal and external determinants and the banking sector development index were expected, as illustrated in the following Table 3.

RESULTS AND DISCUSSION

Correlation between Explanatory Variables. Before estimating the econometric model, it is essential to start by conducting a correlation matrix between the explanatory variables to avoid econometric issues related to autocorrelation among the residuals. This step ensures that the resulting model is not spurious and accurately reflects the true relationship between the study variables. To avoid multicollinearity problems regarding the variables that impact the expansion of the finance sector, we shall give the pairwise correlations matrix of the explanatory factors utilized in the study to validate this. The results are shown in Table 4.

The Table 4 displays the correlation matrix results for the elements influencing the banking industry's growth in the Maghreb countries, specifically Algeria, Morocco, and Tunisia. No text has been given. The findings show that there isn't a statistically significant positive association between the dependent variables, suggesting the absence of multicollinearity among the previously mentioned regression variables. This is advantageous for estimating the model.

Unit Root Tests (Panel Time Series Stationarity). Before estimating the study model, studying the stationarity of the time series is essential in order to

Table 3. **Expected Model Assumptions for Study Variables**

Variables	Expected relationship	Previous studies
Institutional Quality	(+) Positive	Allen et al., 2014; Le et al., 2016; Sami et al., 2014
Legal system	Positive (+)	Filippidis, Katrakilidis, 2014; Levin et al. 2001; Raza et al., 2014
Trade openness	Positive / Negative (–/+)	Andrianaivo, Yartey, 2010; David et al., 2014; Le et al., 2016
Economic growth	Positive / Negative (+/–)	Akçay, 2019; Botev et al., 2019; Touny, 2014
Inflation Income level	Positive / Negative (+/–)	Ibrahim, Sare, 2018; Wahid et al., 2011
Income level	Positive (+)	Kim, Lin, 2011; Law, Azman-Saini, 2012
Democracy	Negative (–)	Raza et al., 2014; Akçay, 2019; Ayadi et al., 2015; Ibrahim, Sare, 2018
Government	Positive (+)	Khalid, Shafiullah, 2020

Source: assembled by authors using data from earlier research.

Table.4. **Correlation Matrix between Independent and Dependent Variables**

Variables	PTE	CPS	*Z*-score	TOP	IQ
PTE	1.000				
CPS	–0.014	1.000			
Z-score	–0.033	–0.913	1.000		
TOP	–0.172	0.559	0.378	1.000	
IQ	–0.202	0.683	0.630	0.641	1.000
IPRI	0.111	0.340	0.418	0.127	0.197
GDP	0.081	–0.508	–0.525	0.061	–0.420
INF	–0.135	0.031	0.222	–0.093	0.148
GOV	0.334	–0.607	–0.569	–0.692	–0.864
POLITY	0.299	–0.456	–0.606	–0.189	–0.598
INCO	0.210	–0.701	–0.810	–0.189	–0.670

Variables	IPRI	GDP	INF	GOV	POLITY
PTE					
CPS					
Z-score					
TOP					
IQ					
IPRI	1.000				
GDP	–0.179	1.000			
INF	–0.108	–0.141	1.000		
GOV	0.003	0.402	–0.172	1.000	
POLITY	–0.199	0.380	–0.520	0.552	1.000
INCO	–0.201	0.690	–0.407	0.520	0.622

Source: compiled by authors using Stata 16 outputs.

uncover the features of the variables utilized in the investigation. This is done by relying on a set of tests that are most commonly used. The results are shown in the Table 5.

The Table 5 presents the results of the LLC, IPS, PP, and ADF tests carried out to evaluate the stationarity of panel data. The data suggest that none of the variables tested exhibit a unit root. These findings indicate that the time series exhibit stationarity at the level, allowing us to reject the significance level of the unit root null hypothesis levels of 5, 10, and 1%. Therefore, we can estimate the model using the following methods:

- the model for Fixed Effects (FE);
- Model of Random Effects (RE).

DYNAMIC PANEL MODEL ESTIMATION USING GMM

Following the examination of the internal and external factors influencing banking sector development using the static panel model, we will proceed to test the same hypothesis using the dynamic panel model. This is necessary because the first model encounters certain econometric problems that can only be addressed through the application of the Panel Dynamic GMM method.

Heteroscedasticity Test. We will do the Wald test to see if the variables exhibit heteroscedasticity in the error term. The Wald test results are shown in the Table 6.

The test yields a table above with the probability value for the stability of the banking index is (Prob > Chi2 = 0.7992), The Chi2 score of 18.08 is smaller than the 5% probability threshold. Therefore, H1 is rejected and H0 is accepted as the null hypothesis, which states that the variance is constant, indicating no problem. Meanwhile, the results for the efficiency, depth, and banking development indices show probability values less than 5% (Prob > Chi2 = 0.000). As a consequence, we accept the alternative hypothesis H1 while rejecting the null hypothesis H0, suggesting heteroscedasticity in the error variance.

Autocorrelation Test. Using the Wooldridge test, one may determine the existence or lack of serial correlation among errors in the Panel model. Autocorrelation among mistakes can result in less efficient outcomes due to the presence of biased standard deviations. The results of this survey are presented in Table 7.

The following Table 7 displays the test findings, which reveal that the probability value for each research variable is less than 5% (Prob > Chi2 = 0.000). As a result of the alternative hypothesis H1 being accepted and the null hypothesis H0 being rejected, autocorrelation within the errors is shown.

Table 5. **Unit Root Test Results**

Independent Variable	Individual effects, individual linear trends				
	LLC	breitung *t*-stat	IPS	ADF	PP
CPS	(–1.9229) **	(–1.2051) *	(2.2072) **	(25.6197) **	(8.2108) ***
Z-score	(–4.7055) *	(–0.4683) NS	(–1.4549) ***	(77.9335) *	(138.927) *
BSD	(–1.3392) ***	(–0.9861) NS	(2.4541) **	(25.8483) *	(8.3682) NS
PTE	(–16.1360) *	(–0.1081) NS	(–8.1398) *	(123.304) *	(162.133) *
IQ	(–13.1582) *	(–4.6952) *	(–9.4997) *	(166.921) *	(219.831) *
IPRI	(–55.9654) *	(–3.6913) *	(–26.7659) *	(220.523) *	(199.544) *
GDP	(–5.5031) *	(–6.8064) *	(–1.7555) **	(64.4490) **	(224.980) *
INF	(2.7257) NS	(0.6766) NS	(–3.6910) *	(92.1941) *	(182.218) *
GOV	(–4.2634) *	(0.8739) NS	(0.4178) **	(48.6379) **	(53.130) NS
INCO	(1.1502) **	(–7.4870) *	(1.1865) NS	(45.7871) NS	(133.927) *
POLITY	(0.3536) **	(–5.5759) *	(1.4089) **	(24.0179) NS	(27.663) NS

N o t e s: the 1, 5, and 10% levels of statistical significance are indicated by the symbols *, **, and ***, respectively; NS stands for "Not Statistically Significant", and () represents the T Statistic.

Source: compiled by authors using Stata 16 outputs.

Table 6. **Wald Heteroscedasticity Test**

Variables	Chi2 (24)	Prob
PTE	1203.84	0.0000
CPS	247.96	0.0000
Z-score	18.08	0.7992
BSD	1611.97	0.0000

Source: compiled by authors using Stata 16 outputs.

Table 7. **Wooldridge Autocorrelation Test**

Variables	F(1, 23)	Prob
PTE	50.775	0.0000
CPS	416.230	0.0000
Z-score	130.844	0.0000
BSD	165.500	0.0000

Source: compiled by authors using Stata 16 outputs.

Table 8. **Estimation Results of the Relationship between Banking Development Indicators and Internal and External Determinants Using Dynamic Panel GMM**

Independent Variable	Method of estimation		
	PTE	CPS	*Z*-score
CON	4.5060 (2.5395) ***	–199.9199 (52.0099) *	51.9507 (42.0452) NS
Dependent Variable *t*–2	0.4391 (0.1644) *	0.8039 (0.0990) *	0.8643 (0.1354) *
TOP	–0.0150 (0.0060) *	0.3751 (0.0181) *	–0.2453 (0.0732) *
IQ	0.0226 (0.0088) *	0.7937 (0.2462) *	–0.2947 (0.2504) NS
IPRI	–0.1047 (0.0469) **	0.7964 (0.4414) ***	0.8039 (0.2778) *
INCO	–0.7434 (0.6712) NS	21.4922 (11.1911) **	4.2873 (11.2045) NS
INF	–0.1069 (0.0447) *	–0.8649 (0.1547) *	1.4781 (0.3399) *
GDP	0.0925 (0.0508) **	–3.8889 (0.1960) *	–0.9338 (0.7019) NS
GOV	0.0150 (0.0168) NS	2.3919 (0.1190) *	–1.0903 (0.2123) *
POLITY	–0.0216 (0.0339) NS	–2.8138 (0.1723) *	1.0796 (0.2490) *
Model Diagnostics			
AR (1)	–2.04 [0.042] **	–3.42 [0.001] *	–4.03 [0.000] *
AR (2)	0.76 [0.450] NS	1.11 [0.268] NS	–1.64 [0.101] NS
Sargan Test	7.07 [0.314] NS	5.81 [0.121] NS	7.34 [0.119] NS
Hansen Test	9.49 [0.148] NS	0.13 [0.900] NS	0.82 [0.523] NS
Prob F	0.0000	0.0000	0.0000
No of Instruments	16	16	16
No of Groups	24	24	24

N o t e s: the 1, 5, and 10% levels of statistical significance are indicated by the symbols *, **, and ***, respectively; NS — Not Significative in Statistics; [] — P-values; () — Standard Err. Single-Step Method. The results were estimated at the second lag (Lag 2) using GMM.

Source: compiled by authors using Stata 16 outputs.

ESTIMATING THE RELATIONSHIP BETWEEN BANKING DEVELOPMENT INDICATORS AND INTERNAL AND EXTERNAL DETERMINANTS USING DYNAMIC PANEL GMM

We will now estimate the relationship using the Dynamic Panel model, relying on the Robust test, using three measures to gauge banking sector development: technical efficiency, The *Z*-score and GDP are credited to the private sector. This is seen in the following Table 8.

The absence of second-order serial correlation (AR2) was verified by employing the Arellano et al. (1991) test for every model that was estimated with the GMM technique. Therefore, the null hypothesis H0 was considered true because the probability value of this test was more than 5%.

Furthermore, the Sargan test was utilized to validate the quality and suitability of the instruments employed in the model. The test resulted in a probability value that was more than 5%. This implies that the model's instruments are regarded as legitimate, resulting in the acceptance of the null hypothesis. Therefore, we may deduce the quality of the estimated models and the validity of the moment conditions employed in the estimation.

The findings of the Robust test indicated that both GDP and the depth of the banking business was unaffected by income level. Nevertheless, the level of commercial accessibility and the effectiveness of the legal framework, and governance quality positively impact depth, while inflation rates and democracy negatively correlate with banking sector depth. The results also indicate that the quality of the legal environment, inflation rates, and democracy do not affect banking sector efficiency. Institutional quality, income level, and governance quality positively influence efficiency, while trade openness and GDP negatively impact banking sector efficiency. Furthermore, the results revealed that income level, GDP, and democracy positively affect banking sector stability, while other variables were not statistically significant for banking sector stability, except for trade openness and governance quality, which showed a negative impact on stability.

ASSESSMENT OF THE CORRELATION BETWEEN THE COMPOSITE BANKING DEVELOPMENT INDEX AND INTERNAL AND EXTERNAL DETERMINANTS

The study centered on the composite index utilized for assessing the progress of the banking sector, additionally, the several variables that might impact this progress, both inside and outside. The One-Step System Gaussian Mixture Model (GMM) was utilized to calculate the model. The Table 9 indicates that there is statistical significance for the lagged dependent variable at two specific time periods, with a significance level of 1%.

The results showed that the existence of second-order serial correlation (AR2) was not in doubt, but the null hypothesis of first-order serial correlation (AR1) was rejected at a significance level of 1%. This implies that the faults at various times are unrelated to one another. The probability values exceeded 5%, which further sup-

ported the null hypothesis according to the Sargan test. By proving that there is no correlation between the instruments and the error term, they satisfy the orthogonality criterion, which validates the applicability and quality of the model's instruments as well as the validity and accuracy of the given model.

DISCUSSION OF RESULTS

The trade openness index (TOP) positively impacted the expansion of the banking business, corroborating the hypothesis put out by R. Rajan & L. Zingales (2003) referred to as the "Interest Group Theory". This relationship is supported by many studies (Botev et al., 2019; Dogga et al., 2017; Ibrahim, Sare, 2018; Aibai et al., 2019; Khalid, Shafiullah, 2020), which highlights that openness to capital and international trade is crucial for stimulating financial and banking sector development and financial markets and products, generating competition and threatening the rents of incumbents.

The institutional quality index (IQ) exhibited a strong and statistically noteworthy association at a relevance level of 1%, between the banking industry's degree of progress. This relationship is supported by studies (Aluko, Ajayi, 2018; Khan et al., 2019). This is in line with economic studies that show a favorable relationship between the growth of the banking sector and the caliber of institutions. The phenomena can be explained by the relationship between the improvement of the banking industry and the quality of the institutions.

Additionally, the findings demonstrated a robust and favorable correlation between the legal environment quality index (IPRI) and the growth of the

Table 9. **Estimation Results of the Relationship between the Composite Index (BSD) and Internal and External Determinants Using Dynamic Panel GMM**

Independent Variable	Method of estimation	Independent Variable	Method of estimation
CON	–8.1325 (4.8202) ^{NS}	POLITY	–0.1011 (0.0178) *
Composite Index of BSD_{t-2}	1.0297 (0.1029) *	Model Diagnostics AR (1)	–3.36 [0.001] *
TOP	0.0040 (0.0051) ^{NS}	AR (2)	–0.77 [0.439] ^{NS}
IQ	0.0304 (0.0042) *	Sargan Test	6.33 [0.097] ^{NS}
IPRI	0.0794 (0.0231) *	Hansen Test	0.67 [0.715] ^{NS}
INCO	1.1697 (1.2649) ^{NS}	Prob F	0.0000
INF	–0.0785 (0.0234) *	No of Instruments	16
GDP	0.0346 (0.0796) ^{NS}	No of Groups	24
GOV	0.0546 (0.0140) *		

N o t e s: the 1, 5, and 10% levels of statistical significance are indicated by the symbols *, **, and ***, respectively; NS — Not Statistically Significant; () — Std. Err; [] — P-values. The results were estimated using One-Step System GMM at the second difference (L2).
Source: compiled by authors using Stata 16 outputs.

banking industry, with statistical significance at the 1% level. The study indicates a direct relationship between the effectiveness of the legal system and the expansion of the banking sector in the Maghreb nations. Studies confirming this result include S. Raza et al. (2014), I. Filippidis, C. Katrakilidis (2014), O. Aluko, M. Ajayi (2018), and E. Čižo et al. (2020). This suggests that in countries where legal systems prioritize the preservation Regarding creditor rights and the execution of contracts.

The expansion of the banking sector in was positively impacted by the income level index (INCO) in the Maghreb nations. This was confirmed by T. Beck et al. (2003) and D. Jaffee, M. Levonian (2001), which individual or source asserted that there is a direct correlation between per capita GDP and the structure of the banking sector? Additionally, they emphasized that income inequality might potentially rise in underdeveloped financial systems. Nevertheless, our research showed that Income level has little bearing. Supporting studies include (Ghardallou, Boudriga, 2014; Akçay, 2019; Jauch, Watzka, 2016; Kim, Lin, 2011), how the banking industry is developing in the Maghreb nations.

The banking industry's growth is favorably connected with the inflation rate (INF), a strong and statistically significant link, with a significance level of 1%. This relationship was confirmed by Huybens et al. (1999), and J. Boyd et al. (2001), S. Akçay (2019), M. Ibrahim, Y. Sare (2018), A. Aibai et al. (2019), I. Arif, A. Rawat (2019), and E. Čižo et al. (2020). They came to the conclusion that banks are often less active and efficient in nations with high rates of inflation.

The expansion of the banking industry was directly correlated with the GDP growth rate of the economy. When the Maghreb nations have higher growth rates, they often attain higher levels of development. This corroborates Robinson's (1952) proposition, positing that economic expansion engenders a need for diverse financial services, prompting the financial system to react spontaneously to these needs, thus fostering financial advancement. This hypothesis was supported by J. Boyd et al. (2001), and J. Greenwood et al. (1997), A. Torre et al. (2013), M. Touny (2014), J. Botev et al. (2019), who stated that increased economic activity boosts demand for financial services, Enhances the probability of project success and reduces the default rate, expanding the financial scope to accommodate demand. Nevertheless, our study findings suggest that economic expansion does not play a crucial role in the development of the banking sector in the Maghreb nations.

At a significance level of 1%, the governance quality index (GOV) demonstrated a strong and statistically significant correlation with the banking industry's growth. It is possible to explain the relationship between political stability and a country's ability and desire to enact reforms, fortify institutions, and enforce laws that safeguard investments in the following ways. Supporting studies include: (Aibai et al., 2019; Ayadi et al., 2015; Khalid, Shafiullah, 2020; Ibrahim, Sare, 2018). Political instability is a major barrier to institutions operating effectively, which results in inadequate financial intermediation.

Moreover, the democracy index (POLITY) showed a strong and substantial negative correlation with the level of development in the banking sector, with a

significance level of 1%. Supporting studies include: Hubrecht et al., 2005; Akçay, 2019; Wahid et al., 2011; Ayadi et al., 2015. These data indicate that the democratic government is not successful, heightened levels of authoritarianism, along with insufficient execution of financial reforms, might greatly hinder the growth of the banking industry.

CONCLUSION

This research aims to evaluate the advancement of the banking sector and the determinants that impact it in the Maghreb nations (Algeria, Morocco, and Tunisia). The analysis will employ four measures, namely efficiency, banking stability, and financial depth. Additionally, a composite indicator will be generated by amalgamating these three indicators via the Principal Component Analysis (PCA) methodology, and the GMM Panel model. The study will cover the period from 2006 to 2023. The analysis will be conducted on a sample of 24 commercial banks. The study reached several key findings:

• the findings indicate that the institutional quality index (IQ) encourages the expansion of the banking industry by augmenting both the depth and efficiency of the sector. However, it does not enhance the banking industry's stability in the Maghreb countries during the period 2006-2023;

• the study also found that trade openness (TOP) increases the depth of the banking sector, which in turn promotes the banking industry's development. However, it reduces the banking sector's stability and efficiency in the Maghreb countries;

• additionally, the study demonstrated a positive the correlation between the expansion of the banking sector and the legal environment's standards as measured by the Intellectual Property Rights Index (IPRI). However, it reduces the efficiency of the banking sector;

• macroeconomic indicators show that the rate of inflation (INF) reduces the level of banking sector development through financial depth and efficiency levels;

• the economic growth rate (GDP) negatively correlates with banking sector depth. It positively correlates with banking sector efficiency. However, it shows no relationship with banking sector stability;

• the auxiliary variables (IV), represented by income level (INCO) have a favorable Impact on the expansion of the banking sector through financial depth. However, during the research period, the banking industry in the Maghreb nations remained unaffected in terms of efficiency and stability;

• Governance (GOV) positively correlates with banking sector depth, however, it negatively correlates with the banking industry's stability in the Maghreb countries, and has no effect on banking sector efficiency;

• finally, the study found that the democracy index (POLITY) reduces banking sector development through financial depth and improves it through banking stability. However, it shows no relationship with banking sector efficiency in the Maghreb countries.

Thus, doing an empirical analysis of the evolution of the banking sector and its determining factors enables us to evaluate the hypothesis described above in the following manner:

• we confirm that the institutional quality index, the quality of the legal environment, and governance significantly influence the expansion of the banking business in the Maghreb nations (Algeria, Morocco, and Tunisia). Inflation rates and democracy hinder the expansion of the banking industry. The banking sector development index is not influenced by additional criteria such as trade openness, income level, and GDP;

• we also confirm the validity of the second hypothesis, since the data indicate that Moroccan commercial banks exhibit the highest level of performance in the sample when it comes to the growth of the banking industry. The data shows that they accumulated substantial financial resources (private sector credit to GDP), banking stability (*Z*-score), and strong technical efficiency rankings. The banking sector's technical innovation, smart risk management, and active financial markets are credited for its success. In contrast, Tunisian and Algerian banks face severe fluctuation in depth and stability due to increased governmental intervention. This affirms the existence of limitations in the banking industry caused by the prevalence of public banks;

• the research suggests that in order to get prosperous banking growth, it is important to improve institutional quality, establish an effective legal system that follows the rule of law and promote open commerce by supporting exports in sectors other than hydrocarbons, particularly in rentier states. Additionally, maintaining macroeconomic stability is crucial. This promotes the efficiency, stability, and growth of the financial system.

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Received on September 16, 2024
Reviewed on October 07, 2024
Revised on November 05, 2024
Signed for printing on November 13, 2024

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ДЕТЕРМІНАНТИ РОЗВИТКУ БАНКІВСЬКОГО СЕКТОРУ: ДАНІ ЩОДО КРАЇН АРАБСЬКОГО МАГРИБУ

Розраховано показники розвитку банківського сектору в країнах Магрибу (Алжир, Марокко і Туніс), висвітлено його детермінанти за допомогою методу узагальнених моментів (GMM) для моделі динамічної панелі. У дослідженні, що охоплює 24 комерційні банки (державні й приватні), використано три індикатори (ефективність, глибина, стабільність) і зведений індикатор з методу головних компонентів (PCA) за 2006—2023 рр. Одним з ключових висновків є те, що інституційна якість, правове середовище і управління поліпшують діяльність банківського сектору, тоді як інфляція і демократія перешкоджають їй. Інституційна якість підвищує ефективність, натомість відкритість торгівлі, правова якість і економічне зростання знижують ефективність у країнах Магрибу.

Результати підкреслюють, що відкритість торгівлі, інституційна і правова якість, рівень доходу й управління позитивно корелюють з фінансовою глибиною, тоді як інфляція і економічне зростання демонструють зворотну залежність. Що стосується індексу стабільності, то він позитивно корелює з інституційною якістю і рівнем доходу і обернено — з відкритістю торгівлі в банківському секторі й економічним зростанням.

Відповідно, зроблено висновок, що марокканські комерційні банки, порівняно з банками Тунісу і Алжиру, мають найвищий рівень банківського розвитку, оскільки дані свідчать, що вони накопичили значні фінансові ресурси (кредитування приватного сектору), характеризуються банківською стабільністю (*Z*-індекс), високими рейтингами технічної ефективності й технічними інноваціями в банківському секторі. У свою чергу, туніські й алжирські банки стикаються з серйозними коливаннями глибини і стабільності через посилене державне втручання.

***Ключові слова**: ефективність банківської діяльності; аналіз оболонки даних (DEA); розвиток банківського сектору; метод узагальнених моментів (GMM) для моделі динамічної панелі.*

Надійшла 16.09.2024
Прорецензована 07.10.2024
Доопрацьована 05.11.2024
Підписана до друку 13.11.2024