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Market Concentration Metrics and Their Impact on Banking Competitiveness: A Comprehensive Analysis

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Abstract :
The study aims to investigate the level of market concentration in the banking sector. The purpose of this article is to identify and measure market concentration through an analytical study on a sample of 10 banks in the UAE during the period 2010-2021. We utilized market shares (MS), the concentration ratio of the largest five banks (CR5), as well as the Herfindahl-Hirschman Index (HHI) to assess competition among banks and characterize the structure of the banking market.
The study's findings indicate that the banking sector in the UAE has experienced a shift towards oligopoly and, in some cases, pure monopoly markets in recent years. This increase in concentration can be attributed to banking mergers and the expansion of larger banks. The UAE banking sector can be characterized as exhibiting a moderate level of concentration, suggesting moderate competition.
Furthermore, the study concludes that conventional banks exert significant control over the banking industry. Market shares for loans and deposits are concentrated among the largest conventional banks

Keywords: Market Concentration; Market shares; Concentration ratio CR; HH index.
Jel Classification Codes: D40, D010, G21.

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1. INTRODUCTION

market concentration is considered one of the most crucial determinants of market structure and is widely used in analyzing the competitiveness of a sector within the market. It provides a general idea of the distribution of producers, relying on various indicators that contribute to measuring the level of competition within the industry.

The degree of competition in the banking sector, in particular, plays an important role in the efficiency of financial services, the quality of financial products and the innovation in the sector. It has implications for borrowers' access to finance, the allocation of funds in an economy and the resulting economic growth, and the degree of financial stability. Appropriately measuring the degree of banking competition over time within and across banking markets remains as important as before, otherwise any policy measures may be misguided.

From the introduction, the following question is addressed:

What it the reality of market concentration in the UAE banking sector and their Impact on Banking Competitiveness?

To answer the main question, the study has formulated the following hypotheses:

1. The UAE banking market is dominated by the oligopolistic market.
2. Market shares of all Assets, loans and deposits are concentrated at the level of conventional banks.
3. Large banks have a high concentration ratio includes conventional and Islamic banks.

2. Literature Review:

Many researches in the banking industry have been conducted to examine concentration measuring techniques, ((Jacob & Katharina, 2002); (Ismail, 2017); (Etty & Noer, 2014); (Mehmet & Nawar, 2012); (Uzonwanne & Ezenekwe, 2018)) agree that there are many concentration criteria such as concentration ratios, HHI, Lorenz curve, Gini coefficient… The most widely used are the company concentration rate (CRn) and the Herfindahl-Hirschman Index (HHI), it can be determined which of the competitive markets are in the scope of perfect competition.

(Charles & Charles, 1991) explores the relationship between market concentration and competition in the U.S. banking industry, using data from the 1980s. It examines how changes in market structure impact competition and consumer welfare. (Xavier & Kebin, 2014) analyzes the relationship between banking competition, market concentration, and financial stability. It emphasizes the importance of leverage in understanding how competition affects the stability of banks,

2.1 Market Concentration Metrics:

The significance of concentration ratios lies in their capacity to encapsulate the structural characteristics of a market. Concentration ratios are frequently employed within structural frameworks that elucidate the competitive dynamics within the banking sector, attributing competitive outcomes to the prevailing market configuration (Jacob & Katharina, 2002). Subsequently, it is pertinent to enumerate the foremost indicators of market concentration that have a bearing on growth

2.1.1. The k bank concentration ratio (CR_k):

simplicity and limited data requirements make the k bank concentration ratio one of the most frequently used measures of concentration in the empirical literature. Summing only over the market shares of the k largest banks in the market (Jacob & Katharina, 2002), it takes the form:

$$CR_k = \sum_{i=1}^{k} \left(\frac{xi}{x}\right) = \sum_{i=1}^{k} Si$$

where CR_k; concentration rate for k banks, xi: production of a company (bank), x: total production enterprises in the same industry, Si: single enterprise (bank) share of market. Giving equal emphasis to k leading banks, but neglecting the many small banks in the market, there is no rule for the determination of the value of k, so that the number of banks included in the concentration index is rather arbitrary decision. The concentration ration may be considered as one point on the concentration curve, and it is one-dimensional measure ranging between zero and unity. The index approaches zero far an infinite number of equally sized banks (given that the k chosen for the calculation of the concentration ratio is comparatively small as compared to the total number of banks) and it equals unity if the banks included in the calculation of the concentration ratio make up the entire industry.

2.1.2. The Herfindahl-Hirschman Index (HHI):

It is the most commonly used method after concentration ratio. HHI is a measure of the distribution ranging from 0 to 1, this index is the sum of the squares of the relevant company shares which is determined as a ratio (percentage) of the total volume of the market (Ismail, 2017). This index is widely used in studies especially in the United States, and has been used by the U.S. Department of justice's Anti-trust Division since 1982, as a measure of market concentration in anti-trust cases (Zhou, 2003). And is calculated according to the following formular:

$$HHi = \sum_{i=1}^{k} \left(\frac{xi}{x}\right)^2 = \sum_{i=1}^{k} Si^2$$

where Si is the bank's market share. $\boldsymbol{HHi}$ is the sum of the squares of banks sizes measured as market shares, as mentioned above, the Herfindahl-Hirschman Index stresses the importance of larger banks, and it incorporates each bank individually, so that arbitrary cut-offs and insensitivity to the share distribution are avoided. The HHI index rages between 1/n and 1, reaching its lowest value, the reciprocal of the number of banks, when all banks in a market are equal size, and reaching unity in the case of monopoly (Jacob & Katharina, 2002).

In banks, the Herfindahl-Hirschman Index measured in two sides, Market share of deposits which is divide total bank deposits per bank by total deposits across the banking sector. And Market share of loans which also measured by divide the volume of bank by the total loans granted at the banking sector level. The HHI became a popular measure of the degree of competition during the 1980s, when the Justice Department used it to classify markets. A market in which the HHI is less than 1,000 is regarded as being competitive. A market in which the HHI lies between 1,000 and 1,800 is regarded as being moderately competitive. But a market in which the HHI exceeds 1,800 is regarded as being uncompetitive. The Justice Department scrutinizes any merger of firms in a market in which the HHI exceeds 1,000 and is likely to challenge a merger if the HHI exceeds 1,800 (Michael, 2012).

2.1.3 Other Market Concentration Index:

Other alternative measures of concentration were proposed during the 60's and 70's. Among those we have the one proposed by Hall and Tideman (1967) and defined as:

$$\boldsymbol{HTI = 1/\left(2\sum_{i=1}^{n} is_i - 1\right)}$$

and the Entropy Concentration Index (ECI) proposed by Jacquemin (1975) and defined as:

$$\boldsymbol{ECI = exp\left(\sum_{i=1}^{n} s_i\, Lns_i\right)}$$

According to their proponents, these two measures are not different from the popular HHI, but the THI has the property of emphasizing the absolute number of credits composing the portfolio, while the ECI is more sensitive to small credits (Fernando & Other, 2012).

2.2. Banking Competitiveness

(Ferahtia, 2018) see that the term "competitive capability" can be defined as a combination or set of distinct, tangible or intangible skills with a unique character, advanced technology, and routines (regular actions) that collectively form a strong foundation and basis for an organization's capacity to compete, thereby achieving a competitive advantage in a specific business or activity sector.

According to (Carol, 2004), the traditional approach to competition has been to associate more firms with more price competition and fewer firms with less-competitive behaviour. This comes from a classic IO argument, called the structure-conduct-performance (SCP) paradigm, that assumes there is a causal relationship running from the structure of the market (e.g., firm concentration) to the firm's pricing behaviour to the firm's profits and degree of market power. That is, a higher number of firms causes firms to price competitively, which minimizes the degree of market power that any one firm can exert.

The concept of competition has played an important role in economic thinking and has been subject to different interpretations. Perhaps one of the most widely used definitions is the one of Stigler (1987), who defines competition as "a rivalry between individuals (or groups or nations) that arises whenever two or more parties strive for something that all cannot obtain". Competition has been viewed as an important driver of productive efficiency and Vickers (1995) highlights three reasons why this might be the case. First, competition allows for performance comparisons that incentives individuals/organizations to become more efficient and avoid slack. Second, competition can cause efficient organizations to thrive at the expense of inefficient ones. Third, competition to innovate represents a push to productive efficiency in the long term (Degryse & Others, 2019).

3. The banking sector of the United Arab of Emirates

3.1. An overview of the UAE banking structure

As of the conclusion of 2021, the total count of licensed commercial banks in the UAE stood at 59. Among these, 22 were classified as local banks, known for their extensive branch networks, which collectively encompassed a remarkable total of 513 branches. The remaining 37 banks were classified as foreign banks, of which 10 specialized in business banking services.

Furthermore, within the framework of the UAE's banking sector, there are 8 dedicated Islamic banks and an additional 23 Islamic financing programs that operate within conventional banks

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Table 1. Evolution of the UAE banking system structure (2016-2021)

Years	2016	2017	2018	2019	2020	2021
N° of Banks	23	23	22	22	21	22

Local Banks	**N° of Branches**	846	771	743	684	598	513
Foreign banks	**N° of Banks**	37	39	38	38	37	37
	N° of Branches	85	82	80	74	61	55

Source: Central bank of the UAE, 2016-2021.

Table No. (01) illustrates a noteworthy trend in the number of local banks from 2016 to 2021, reflecting relative stability. This period witnessed significant banking mergers, such as the consolidation of First Gulf Bank and the National Bank of Abu Dhabi in 2017, as well as the merger of Abu Dhabi Commercial Bank with the Union National Bank in 2019. Consequently, the number of local banks decreased from 23 in 2016 to 22 in 2018, and further decreased to 21 in 2020.

Simultaneously, there has been a consistent 40% reduction in the number of bank branches during this six-year period. This decline can be attributed to the increasing emphasis on digitization, the prevalence of banking mergers, and the impact of the COVID-19 pandemic in recent years.

Regarding foreign banks, the period saw relative stability, with their numbers ranging from 37 to 39. Some foreign banks exited the market in recent years due to their inability to secure sufficient market share to remain competitive. Additionally, entry into the market has been constrained by regulatory restrictions imposed by the Central Bank of the United Arab Emirates

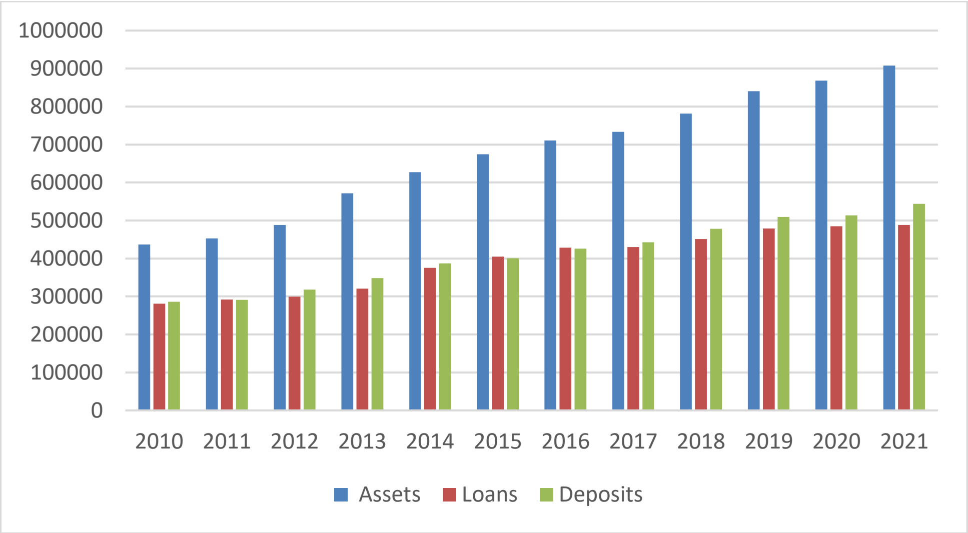
Table 2. Evolution of total assets, deposits and loans of the UAE banking sector for the period 2010-2021. **Unit**: Million U.S Dollar

Years	Total Assets	%	Total Deposits	%	Total Loans	%
2010	437204,88	**5,6**	285806,08	**5,3**	280822,99	**1,6**
2011	452589,83	**4,1**	291279,31	**0,2**	291633,3	**1,8**
2012	487852,68	**4,8**	317991,94	**6**	299284,93	**2,4**

2013	571911,69	**13,1**	348081,09	**9,5**	320578,79	**7,1**
2014	627624,27	**8,5**	387019,99	**11,1**	375229,4	**8**
2015	674759,4	**7,5**	400716,68	**3,5**	404365,5	**7,8**
2016	710975,3	**5,4**	425604,9	**6,2**	428600,2	**6**
2017	733576,2	**4**	443032,1	**4,1**	430234	**1,7**
2018	781228,7	**6,5**	478158,8	**7,9**	450928,8	**4,8**
2019	840317,8	**7,6**	509201	**6,5**	478975,7	**6,2**
2020	868092,4	**3,4**	513285,5	**0,8**	484421,7	**1,2**
2021	907358,06	**4,2**	543783,1	**5,9**	488506,2	**0,8**
Lowest value	**437204,88**		**285806,08**		**280822,99**	
Greatest value	**907358,06**		**543783,1**		**488506,2**	
Average	**674457,601**		**411996,708**		**394465,126**	

Source: Central bank of the UAE, 2010-2021.

figure 1. Evolution of total assets, deposits and loans of the UAE banking sector for the period 2010-2021.



Source: Central bank of the UAE, 2010-2021.

Examining **Table No. (02)** and **Figure No. (01),** we discern a remarkable growth trajectory within the UAE banking sector from 2010 to 2021. This sustained expansion encompasses various key metrics, namely assets, loans, and deposits, despite a temporary decline in these figures in 2020, largely attributable to the COVID-19 pandemic.

In terms of banking assets, a consistent upward trend is evident, characterized by varying annual growth rates. Specifically, these assets surged from approximately \$437 billion in 2010 to approximately \$907 billion in 2021, representing an impressive increase of \$470 billion, equating to a growth rate of 48%.

Similarly, deposits exhibited substantial growth over the same period, ascending from roughly \$286 billion in 2010 to approximately \$544 billion in 2021. This marks an increase of \$258 billion, signifying a growth rate exceeding 53%.

As for **figures (02) and (03)** below, it is evident that the private sector accounts for over 63% of the total deposits within the UAE banking sector. In contrast, the government sector and government-affiliated institutions collectively receive only 37% of these deposits. Furthermore, the data reveals that resident deposits make up an average of 89%, while non-residents contribute to just 11% during the study period.

figure 2. The average of deposits by sector

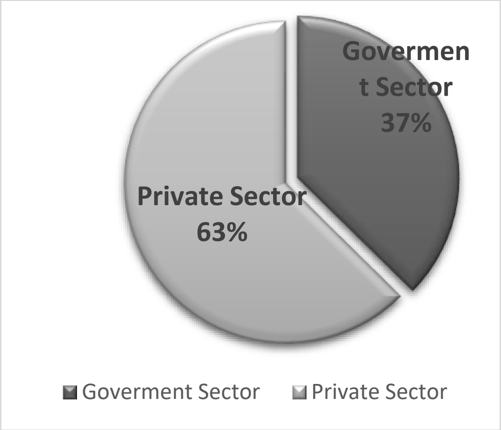
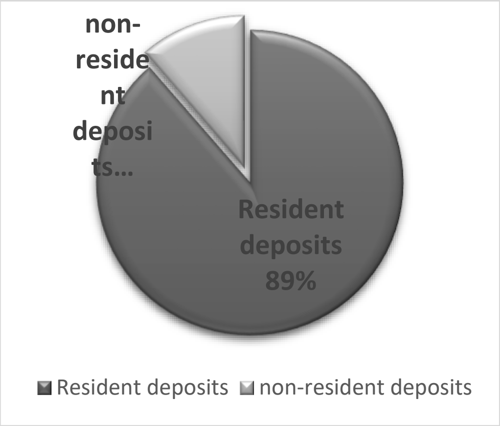


figure 3. The average of deposits by depositors



Source: Central bank of the UAE, 2010-2021.

Regarding Consolidated loans within the UAE banking sector, there has been a notable increase from approximately $281 billion to $489 billion over the span of 2010 to 2021, characterized by fluctuating growth rates. This surge amounted to $208 billion, reflecting a substantial growth rate of 57%. Notably, in the final years of the study period, specifically in 2019, 2020, and 2021, there has been a discernible deceleration in the growth rates of consolidated loans, declining from 6.2% to 1.2% to 0.8%. This deceleration can be attributed to several factors, including the economic downturn, a slowdown in lending growth due to portfolio rebalancing, and corporate loan repayments. Furthermore, as previously discussed, the ongoing impact of the COVID-19 pandemic has contributed to these trends.

Figures (04) and **(05)** below show that the average volume of loans granted to the local market reached 92%, compared to only 8% for the foreign market. On the other hand, the private sector (business sector, industrial sector and individuals) recorded 66% of the total consolidated loans in the banking sector from 2010 to 2021, compared to 34% of loans directed to the public sector, including the government, government-affiliated institutions and non-banking financial institutions.

figure 4. The average of granted loans by sector

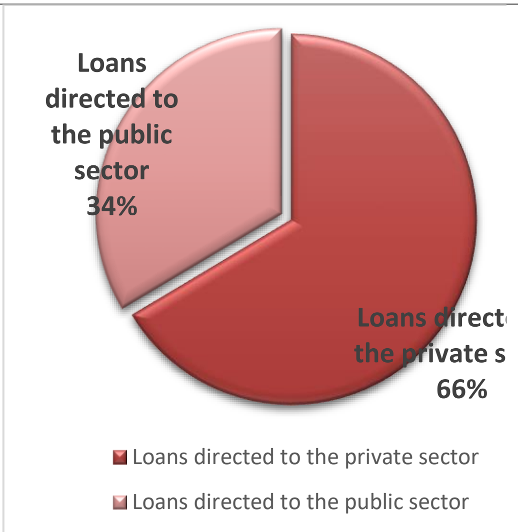


figure 5. The average of granted loans by type of market

Source: Central bank of the UAE, 2010-2021.

3.2. the study sample

The research was conducted by taking secondary data from annual reports of 10 commercial and Islamic bank in UAE (Table 3), and also annual reports of central bank of UAE, for the period 2010-2021

Table 3. The study sample (2010-2021)

Country	Bank's name
The United Arab Emirates	*Emirate Dubai national bank* **(ENBD)** *Abu Dhabi Commercial bank* **(ADCB)** *Abu Dhabi Islamic bank* **(ADIB)** *Bank of Sharjah* **(BOS)** *First gulf bank* **(FGB)** *Dubai Islamic bank* **(DIB)** *Mashreq bank* **(MASQ)** *Emirate Islamic bank* **(EIB)** *Sharjah Islamic bank* **(SIB)** *National bank of Ras Al- Khaimah* **(RAK)**

4. Market shares of assets, loans and deposits for the study sample (MS)

The market share of banks is calculated as follows:

Market share = value of (assets, loans or deposits) of x bank / value of Total (assets, loans or deposits) in the banking sector.

The following table shows the average market shares of each of the assets, loans and deposits of the banks under study.

Table 4. The average of market shares of assets, loans and deposits of banks under study (2010-2021)

The study sample			The Average of Market shares		
	Bank's Name	**Code**	**Assets**	**Loans**	**Deposits**
Conventional Banks	Emirate Dubai national bank	**E-NBD**	0,181	0,199	0,201
	Abu Dhabi Commercial bank	**ADCB**	0,106	0,115	0,104
	Bank of Sharjah	**BOS**	0.011	0,010	0,012
	First gulf bank	**FGB**	0,212	0,181	0,211
	Mashreq bank	**MASQ**	0,048	0,040	0,047
Sum of market shares (MS)			**0,559**	**0,536**	**0,578**
	Bank's Name	**Code**	**Assets**	**Financing**	**Deposits**
Islamic Banks	Dubai Islamic bank	**DIB**	0,067	0,072	0,078
	Abu Dhabi Islamic bank	**ADIB**	0,045	0,048	0,057
	Emirate Islamic bank	**EIB**	0,020	0,019	0,023

Sharjah Islamic bank	**SIB**	0,012	0,007	0,012
National bank of Ras Al- Khaimah	**RAK**	0,016	0,018	0,018
Sum of market shares (MS)		**0,161**	**0,166**	**0,189**

Upon analyzing the data presented in **Table No. (04)**, several noteworthy observations emerge. First Gulf Bank commands a substantial presence in the UAE banking sector, accounting for a notable share of total assets, loans, and deposits, ranging from 18% to 21%. These significant market shares can be attributed to the merger of First Gulf Bank with the National Bank of Abu Dhabi in 2017. Notably, during the period spanning 2018 to 2021, these market shares hovered consistently between 25% and 30%.

Emirates National Bank of Dubai, on the other hand, maintains a robust presence, with average market shares ranging between 18% and 20% across the banking industry. Its peak performance was witnessed in 2020 when market shares for loans and deposits exceeded 24%. In comparison, Abu Dhabi Commercial Bank held an average market share ranging from 10% to 12%, while Dubai Islamic Bank's market share ranged from 6% to 8%.

Conversely, other banks in the sector reported significantly smaller market shares when compared to the aforementioned banks. For instance, Sharjah Islamic Bank's market shares ranged from 0.2% to 1% during the initial years of the study. In contrast, higher market shares, ranging from 4% to 5%, were recorded in 2021 for Mashreq Bank and Abu Dhabi Islamic Bank.

Overall, conventional banks demonstrate dominance within the banking industry, collectively holding an average market share of approximately 56% for assets, 54% for loans, and 58% for deposits. In contrast, Islamic banks maintain a smaller presence, with market shares between 16% and 17% for assets and financing, and 19% for deposits.

In the aggregate, the average market share for assets across all banks in the study sample reached 72% of the total banking assets in the UAE banking sector. Additionally, they held 70% of the loans and 76% of bank deposits. In comparison, the remaining banks in the UAE banking sector collectively held market shares of only 28%, 30%, and 24% for assets, loans, and deposits, respectively

5. Market Concentration in UAE banking sector

In order to calculate the concentration of the banking industry in the UAE market, we will rely on the calculation of the asset concentration ratio, the loan (Islamic Financing) concentration ratio, and the deposit concentration ratio through **(CR_5)** and the The Herfindahl-Hirschman Index **(HHI)** as the most used indicators in calculating concentration ratios.

The **(CR_5)** concentration ratio is calculated according to the following formular:

$$CR_5 = \sum_{i=1}^{5} \left(\frac{xi}{x}\right) = \sum_{i=1}^{5} Si$$

And **(HH_i)** calculated according to the following formular:

$$HHi = \sum_{i=1}^{5} \left(\frac{xi}{x}\right)^2 = \sum_{i=1}^{5} Si^2$$

Where: Si the bank's market share.

Table No. (05) below represents the evolution of the banking industry concentration ratios for the UAE sector, by calculating the concentration ratio of each of: assets, loans and deposits through the concentration ratio (CR5) and the Herfindahl-Hirschman Index (HHI) for the period from 2010 to 2021.

Table 5. The average of market shares of assets, loans and deposits of banks under study (2010-2021)

	Assets Concentration		**Loans Concentration**		**Deposits Concentration**	
Years	CR_5	HHi	CR_5	HHi	CR_5	HHi
2010	0,5308	0,0675	0,5382	0,0727	0,5193	0,0664
2011	0,5388	0,0705	0,5392	0,0753	0,5293	0,0689
2012	0,5393	0,0729	0,5490	0,0784	0,5383	0,0738

2013	0,5024	0,0629	0,5618	0,0820	0,5515	0,0766
2014	0,5089	0,0643	0,5173	0,0668	0,5546	0,0767
2015	0,5272	0,0681	0,5303	0,0691	0,5764	0,0809
2016	0,6332	0,1077	0,6094	0,0962	0,6684	0,1168
2017	0,6443	0,1097	0,6291	0,1002	0,6568	0,1156
2018	0,6589	0,1157	0,6108	0,0931	0,7242	0,1400
2019	0,7458	0,1455	0,7219	0,1311	0,7607	0,1494
2020	0,7768	0,1584	0,7518	0,1413	0,8226	0,1749
2021	0,7755	0,1600	0,7497	0,1391	0,8229	0,1777
Lowest value	0,5024	0,0629	0,5173	0,0668	0,5193	0,0664
Greatest value	0,7768	0,1600	0,7518	0,1413	0,8229	0,1777
Average	0,6152	0,1003	0,6090	0,0954	0,6438	0,1098

6. Results and discussion:

Based on the analysis of the Concentration Ratio (CR5), a noticeable trend emerges within the banking industry. Over the study period, there has been a consistent increase in concentration levels, with intermittent slight decreases in some years. Specifically, from 2010 to 2015, the concentration ratios for the entire banking sector exceeded 50%, and this trend continued to rise, surpassing 60% during the 2016-2017 period. In the final years of the study, concentration peaked, exceeding 70% for assets and loans, and exceeding 80% for deposits. This indicates that the five largest banks in the UAE's banking sector collectively control between 50% and 77% of banking assets, between 51% and 75% of loans, and between 51% and 82% of deposits, depending on the year under consideration.

Through the CR5, it can be concluded that the UAE banking market transitioned from an oligopolistic market structure, with concentration ratios ranging between 50% and 70%, in the period from 2010 to 2018, to a market structure that resembles an oligopoly to pure monopoly, with concentration ranging between 70% and 100% in the latter years.

Turning to the Herfindahl-Hirschman Index (HHI), it exhibited a consistent upward trajectory throughout the study period. In the 2010-2015 period, the HHI values ranged between 0.06 and 0.1, indicating a weak concentration in assets, loans, and deposits, signifying high competition. Conversely, from 2016 to 2021, the HHI values increased to a range between 0.1 and 0.17, reflecting a moderate concentration. Thus, during this latter period, the UAE banking industry experienced a moderate level of competition

7. CONCLUSION

from the Analytical findings of this study, related to examining the concentration of the UAE banking sector, we conclude the following results

- The UAE banking sector was affected by the global pandemic COVID-19 in the growth of Assets and financial intermediation (loans and deposits).
- The UAE banking sector is dominated by between oligopoly and pure monopoly market in the last years, where the reason behind this increase of concentration is banking mergers and the expansion of large banks.
- Conventional banks control the banking industry, where market shares of loans and deposits are concentrated at the level of large conventional banks.
- The UAE banking sector is characterized by a medium degree of concentration 'moderate competition'.
- From market shares, we can say that Conventional banks are more efficient compared to Islamic banks in financial intermediation.

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