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## Article

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## Article

# Efficiency and Competitiveness of Banking in Indonesia Based on Bank Core Capital Group

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**Abstract:** The banking sector in Indonesia is currently growing and developing. This is due to the Indonesian Financial Services Authority (OJK) implementing reforms to strengthen the banking sector and enhance financial stability. One of the reforms is in the form of regulation that categorizes banks into four special categories based on core capital. This study aimed to analyzing the relationship between the efficiency and competitiveness of BUKU 1 to IV banks and KBMI 1 to IV banks in Indonesia. The data in this study were collected from journals, scientific articles, banking statistics, and financial reports of all banks based on KBMI (formerly BUKU) published by the Financial Services Authority (OJK) and the Indonesia Stock Exchange (IDX) for the period from 2018 to 2023. The results found there are no significant changes in patterns within the BUKU and KBMI groups. However, in the KBMI 4 group, a positive correlation between competitiveness and efficiency is observed, meaning that an increase in efficiency will be followed by an increase in a bank's competitiveness. This group has the same pattern as the KBMI 1 and KBMI 3 groups. Meanwhile, the KBMI 2 group still follows the same pattern as in the BUKU 2 group, where an increase in efficiency is accompanied by a decrease in competitiveness, and vice versa; an increase in competitiveness will be followed by a decrease in a bank's efficiency.

**Keywords:** banking; competitiveness; efficiency; core capital; concentration ratio



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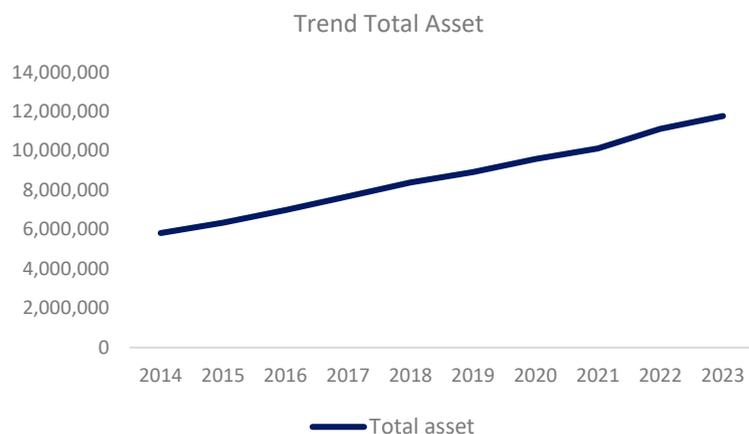
## 1. Introduction

The banking sector is still experiencing development and facing challenges such as increasingly tight competition, regulation, and technological advancements (Palmié et al. 2020). Banks need to focus on efficiency by streamlining processes, automating tasks, and reducing costs (Villar and Khan 2021). At the same time, banks must also strengthen risk management systems (Settembre-Blundo et al. 2021). The bank will remain competitive and superior by investing in innovative technology, pursuing new business opportunities, and providing outstanding customer service (Thomas 2020). By maintaining a balance between efficiency and competitiveness, banks can continue to thrive in an ever-changing environment.

The banking sector in Indonesia is currently growing and developing, as seen in Figure 1. This is due to the Indonesian Financial Services Authority (OJK) implementing reforms to strengthen the banking sector and enhance financial stability. This policy has led to a decrease in the number of operating banks, increasing total assets, and the introduction of new financial products and services.

The positive performance of a company is supported by its robust business capability to formulate responses to external challenges (Sabatino 2016). Therefore, according to Lloret's (2016) analysis, success in competition requires awareness of the conditions under which a company can generate or lose value, and the company's competitiveness reflects its performance and long-term relationships within the industry and with competitors.

Sustainable companies demonstrate long-term success despite the constraints imposed by economic, social, and environmental systems by developing strategies that generate and capture future value sustainably. In reality, good businesses are able to leverage unfavorable environmental conditions and consider what they need to do, as well as implement the adaptive transformation activities necessary for long-term survival, which can help the company remain resilient in its business activities (Lengnick-Hall et al. 2011).



**Figure 1.** Total bank assets for the period of 2014 to October 2023 (in Miliar Rupiah).

The banking industry worldwide must respond to evolving business conditions globally and digitalization to remain competitive. The efficiency and total assets of these banks are the main determinants of their competitiveness in at least three out of six countries (Chotigeat et al. 2004). Based on research conducted by Erasmus (2014), most banks remained efficient despite the global financial crisis. It can be said that the efficiency demonstrated by banks previously played a role in their ability to be resilient during the crisis. In the context of efficiency itself, not all banks have the same ability to improve their efficiency. Ariff and Shawtari (2019) state that the Islamic subsidiaries of conventional banks perform better than standalone Islamic banks in various aspects, including corporate efficiency. The consequence of this is that the Islamic banking industry will be controlled by its parent bank and become uncreative, which will impact long-term sustainability. Just like conventional banks, the size of Islamic banks can contribute to the strength and stability of the banking system as a whole (Jan and Marimuthu 2015).

Based on the research conducted by Jiménez-Hernández et al. (2019), it is explained that banks with weak capital positions have lower profitability and worse credit portfolio quality than others (high NPLs). This indicates that an increase in bank size makes the bank more efficient and more specialized in loans and credits, which impacts the increase in efficiency. This study states that domestic banking seems to have an advantage in terms of efficiency, but these weak results may indicate that national banks and foreign banks do not show significant performance differences. Banks with better financial conditions also have higher efficiency levels, as explained by Xiang et al. (2015), that banks in better financial conditions tend to not lose funds to loans, so they do not need to spend a lot of funds to recover loans. Therefore, to improve efficiency, banks need to increase their net income, reduce the amount of idle funds, lower operational costs, and invest more money in options that will generate income to increase net income by reducing operational costs and obtaining their funds from cheaper sources (Korzeb et al. 2021). Meanwhile, according to Svitalkova (2014), the main sources of banking inefficiency are insufficient loans provided and NPLs (non-performing loans).

In order to encourage the consolidation of banking, on 27 December 2012, the Central Bank of Indonesia issued Bank Indonesia Regulation (PBI) Number 14/26/PBI/2012 concerning Business Activities and Office Networks Based on Bank Core Capital, which came into effect on 2 January 2013. This regulation categorizes banks into four special categories

based on core capital, namely (a) Commercial Banks with Business Activities (BUKU) 1; (b) BUKU 2; (c) BUKU 3; and (d) BUKU 4.

We expect the issuance of these regulations to encourage banks to consolidate and/or increase their core capital, as the PBI determines the business activities a bank can undertake based on its position in a particular BUKU. Banks can conduct activities ranging from basic banking services to more complex ones, as regulated by BUKU. The higher the BUKU and the higher the core capital owned by the bank, the broader the range of products and activities that a bank can undertake, and vice versa. For banks with BUKU 1, their range of products and activities is limited, including prohibitions on capital participation, asset securitization, trade finance services, foreign exchange transactions, and other activities detailed.

Following the transfer of banking supervision to the Financial Services Authority (OJK), the Financial Services Authority updated Bank Indonesia Regulation (PBI) Number 14/26/PBI/2012 with Financial Services Authority Regulation (POJK) Number 6/POJK.03/2016, which addressed Business Activities and Office Networks Based on Bank Core Capital, and POJK Number 17/POJK.03/2018, which addressed Amendments to POJK Number 6/POJK.03/2016. In 2021, OJK revoked the POJK on BUKU and issued POJK Number 12/POJK.03/2021 concerning commercial banks as a replacement. The Core Capital-Based Bank Group (KBMI), as outlined in Article 1 number (20) of POJK Number 12/POJK.03/2021 concerning Commercial Banks, is a grouping of banks based on their core capital. The Core Capital-Based Bank Group (KBMI) encompasses BHI Banks (Indonesian Legal Entity Banks), KCBLN (Branches of Banks Located Abroad), general banks conducting sharia business activities, and the sharia business units of BHI Banks. The core capital for the sharia business units of banks is based on the core capital of the parent bank.

Based on the Table 1. OJK issued POJK Number 12/POJK.03/2021 concerning commercial banks, considering that many banks with good risk management cannot develop optimally due to capital regulation constraints. Among other reasons, the bank's BUKU regulations restrict these small banks from issuing new products and services. Therefore, OJK revoked the grouping of bank business activities based on core capital (BUKU) with the issuance of POJK Number 12/POJK.03/2021. According to POJK Number 12/POJK.03/2021, the regulator permits the bank to apply for new licenses for products or services, provided it maintains good risk management.

**Table 1.** Comparison of bank regulations based on core capital between BUKU provisions and KBMI.

No	POJK Number 6/POJK.03/2016	POJK Number 12/POJK.03/2021
1	BUKU 1: Bank with core capital < IDR 1 trillion	KBMI 1: Bank with core capital up to IDR 6 trillion
2	BUKU 2: Banks with core capital of IDR 1 trillion up to < IDR 5 trillion	KBMI 2: Banks with core capital > IDR 6 trillion up to IDR 14 trillion
3	BUKU 3: Banks with core capital of IDR 5 trillion to less than IDR 30 trillion	KBMI 3: Banks with core capital > IDR 14 trillion up to IDR 70 trillion
4	BUKU 4: Bank with a minimum core capital of IDR 30 trillion	KBMI 4: Banks with core capital > IDR 70 trillion

Source: (Otoritas Jasa Keuangan Republik Indonesia 2021).

The banking industry in Indonesia conducts its business activities based on the classification of banks according to BUKU, and then it refers to the classification of banks according to KBMI. Previously, when the BUKU regulations were in effect, there were restrictions on business activities and the network of bank offices based on core capital, resulting in larger and medium-sized banks (BUKU III and BUKU IV banks) relatively

becoming the winners in the competition for liquidity. Meanwhile, BUKU I banks, in order to attract depositors, will raise interest rates higher to seek sources of funds for their credit distribution. This will ultimately cause the margin of BUKU I banks to erode and negatively impact the bank's profitability and efficiency.

After the BUKU regulations were revoked in 2021 and replaced with the KBMI regulations, the OJK stipulated that as long as the bank has good risk management according to the regulator, the bank is allowed to apply for new licenses without being tied to its core capital. However, despite the KBMI regulations being in effect, based on the financial performance data of BUKU 1 to BUKU 4 banks from December 2014 to December 2020, as well as KBMI 1 to KBMI 4 for the period from 2021 to October 2023, it is known that in terms of performance, KBMI 1 banks remain below the performance of KBMI 4 banks.

Banks with core capital exceeding IDR 70 trillion or classified as KBMI 4, namely PT Bank Rakyat Indonesia Tbk, PT Bank Mandiri Tbk, PT Bank Negara Indonesia Tbk, and PT Bank Central Asia Tbk, have significantly higher opportunities for credit distribution and fund collection and are capable of providing a wider range of banking services, thereby increasing their market share. The market share of total assets of KBMI 4 banks as of September 2023 is 49.94% of the total banking assets in Indonesia. Meanwhile, the market share of the total assets of the 20 largest conventional commercial banks as of September 2023 is 79.16% of the total banking assets in Indonesia. The number of banks in Indonesia is 105 as of November 2023, with 66 banks (62.86%) being KBMI 1 banks. This results in the efficiency and competitiveness of KBMI 4 banks being relatively better compared to KBMI 1 banks (formerly BUKU 1 and BUKU 2 banks).

This research differs from previous studies, such as the one performed by [Ruza et al. \(2019\)](#), who analyzed the factors affecting the stability of the banking system, as well as [Jiménez-Hernández et al. \(2019\)](#), who analyzed various factors that could explain the differences in the efficiency of commercial banks in 17 Latin American countries. Similarly, [Sari et al. \(2022\)](#) examined the impact of competition on banking efficiency, and [Repková and Stavárek \(2014\)](#), who studied how market structure could pose a threat to efficient fund intermediation through the banking sector and promote economic growth. [Sari et al. \(2022\)](#), in their research, explain that the size of the bank does not have a significant impact on its performance. [Jiménez-Hernández et al. \(2019\)](#), in their research, analyze the efficiency and productivity of the Latin American banking sector.

Banking efficiency has attracted the interest of many researchers with various approaches. Among them are [Astiyah and Husman \(2006\)](#), who studied the efficiency levels of the 20 largest banks in Indonesia using the stochastic frontier analysis method. Their research results show that banks from the group of foreign banks tend to be more efficient. The same thing also happens with the Regional Development Bank group (BPD). Another finding from their research is that several banks that calculate efficiency based on the intermediation approach model show high profits but are inefficient. This indicates that those banks have not performed their intermediation function well. As a result, they do not contribute optimally to broader economic growth.

The banks performed poorly during the 2009–2015 period, and the managers were incompetent in using their input resources effectively, even though they had previously achieved fairly optimal operations. In other words, banks in Indonesia operated inefficiently during that period. From various findings of bank efficiency studies in Indonesia over different observation periods, it can be concluded that banks in Indonesia have not yet operated efficiently. Therefore, further research is needed on the factors that can lead to bank efficiency. Studies on the factors causing bank efficiency have been conducted previously, but the results showed inconsistencies in the variables.

This research will focus more on the influence or impact of grouping banks based on core capital, whether according to BUKU or KBMI regulations, on the efficiency and competitiveness, as well as the correlational relationship between the efficiency and competitiveness of banks to prove that an increase in efficiency will enhance the competitiveness of banks against challenges from both internal and external factors. The novelty of this

research lies in the absence of studies on the correlational relationship between efficiency and competitiveness based on the grouping of banks according to core capital. This research expands the theoretical foundation of previous studies and the concept of organizational efficiency and competitiveness in Indonesia Bank.

This study aimed to analyzing the relationship between the efficiency and competitiveness of BUKU 1 to IV banks and KBMI 1 to IV banks in Indonesia. In this study, we suggest that there is a relationship between efficiency and competitiveness. We hypothesize that the benefits of efficiency can lead to differences in the impact on competitiveness. In the research questions in this study, the grouping of business activities and office networks is based on the bank's core capital according to how BUKU and KBMI affect efficiency and competitiveness.

## 2. Materials and Methods

The collected data for this study are from journals, scientific articles, banking statistics, and financial reports of all banks based on KBMI (formerly BUKU) published by OJK and the Indonesia Stock Exchange (IDX) for the period from 2018 to 2023. The secondary data are obtained from the statistical data published by OJK, which consists of the following data: primary liquid assets, secondary liquid assets, loan-to-deposit ratio, third-party funds (current accounts, savings, and deposits), operational-expenses-to-operational-income ratio, cost-to-income ratio, return on equity, non-performing loan, capital adequacy ratio, equity value compared to total assets, and retained earnings compared to total assets.

The paradigm of conventional banks is that the more efficient the bank's operations, the lower the cost per unit, which allows them to attract customers through lower loan interest rates and higher deposit interest rates (Aigner et al. 1977). Consequently, achieving higher operational efficiency can have an impact on the competitiveness of the banking industry (Aigner et al. 1977). Furthermore, banking efficiency in a competitive environment that will enhance the competitiveness of the banking sector (Aigner et al. 1977). A strong business relationship will successfully make customers willing to pay premium rates for sustainable products and services. Therefore, the researchers formulated the following hypothesis. H1: There is a positive relationship between increased efficiency and increased competitiveness. We conducted data testing using panel data.

This study employed the stochastic frontier analysis (SFA) method, an econometric technique that gauges bank efficiency by contrasting the bank's actual performance with the theoretical limit of optimal performance (Aigner et al. 1977). Generally, bank efficiency analysis uses SFA as a method to estimate the optimal performance level for a bank, taking into account the available resources and technology. SFA uses statistical models to determine the maximum possible efficiency frontier and compare the bank's actual performance with it. This allows for the calculation of technical efficiency, which is a measure of how well the bank uses its inputs to produce outputs, as well as the estimation of sources of inefficiency.

SFA is used to determine the efficiency value over time. The efficiency value produced is in the form of a score from 0 to 1. The closer the score is to 1, the more efficient the bank is, and vice versa; the closer the score is to 0, the less efficient the bank becomes. The SFA method uses  $U$  (controllable error) to obtain the efficiency value. Production function analysis using SFA is conducted by employing equations that follow the parameterization of the time-varying model. For data processing with SFA, the Frontier 4.1 software can be used. The standard SFA function with a production function has the following general (log) form:

$$\ln(Q1) = \beta_0 + \beta_1 \ln(P1) + \beta_2 \ln(P2) + \beta_3 \ln(P3) + \beta_4 \ln(P4) + \dots + \beta_n \ln(Pn) + \epsilon_n$$

where  $P1$ ,  $P2$ ,  $P3$ , and  $P4$  are the inputs in this study, namely BOPO, the cost-to-income ratio, ROA, and ROE. Meanwhile,  $Q1$  is the output quantity in this study, namely the total

financing at bank  $n$ . The error term,  $En$ , of both functions consists of two components, as seen in the following equation:

$$En = Vi - Ui$$

where

$Ui$  = controllable random factor (inefficiency);

$Vi$  = uncontrollable random factor (random noise).

The assumptions used are as follows:  $Ui \sim iid | (0, \sigma u^2) | Vi \sim iidN(0, \sigma V^2)$   $Ui$  and  $Vi$  are independently distributed from each other, as well as from the input variables.

The Herfindahl–Hirschman Index is the sum of the squares of the total market share of each company competing in the market (DePamphilis 2020). This ratio has a weakness in that it is less sensitive to changes in the number of banks in industries with a large number of banks (Bikker and Haaf 2000). Concentration ratios are also used to measure the impact of concentration on competition. Based on the Table 2, concentration ratios are often used in structural models that explain competitive performance within the banking industry as a result of market structure. Concentration ratios can also reflect changes in concentration as a result of a bank entering or exiting the market or due to mergers. The concentration ratio is calculated through the total market share of the largest number of banks in the market (Bikker and Haaf 2000). According to Bikker and Haaf (2000), the simplicity and the limited data required to create the bank concentration ratio make it the most frequently used ratio in the empirical literature to measure concentration. This ratio is calculated by ignoring the presence of small banks in the market.

**Table 2.** Industry classification with concentration ratio.

$CR_4$	Category	Interpretation of the Market Structure
$CR_4 = 0$	Minimal	Perfect competition
$0 < CR_4 < 40$	Low	Effective competition or monopolistic competition
$40 \leq CR < 60$	Middle to low	Loose oligopoly or monopolistic competition
$60 \leq CR_4 < 90$	Middle to high	Tight oligopoly or dominant companies with a few small competitors
$CR_4 \geq 90$	High	Effective monopoly (approaching monopoly or a few dominant companies)
$CR_4 = 1$	Maximum	Perfect monopoly

Reference: Bikker and Haaf (2000).

### 3. Results and Discussion

The average efficiency level of banks in the BUKU category (period 2018–2020) is 0.594, 0.41 points higher than the KBMI category (period 2021–2023), with an average of 0.553. Statistically, the difference in efficiency levels between the two groups, BUKU and KBMI, is significant, indicating that the BUKU category is more efficient than KBMI. In other words, the efficiency level of banks before the issuance of POJK Number 12/POJK.03/2021 was better compared to after the policy was implemented.

Based on Table 3, the difference in the efficiency levels of banks in the BUKU category is statistically significant. The group of banks in the BUKU 4 category has the highest efficiency level with a value of 0.666. However, the other three groups, namely BUKU 1, BUKU 2, and BUKU 3, do not show a statistically significant difference, indicating that these three groups have similar efficiency levels.

**Table 3.** Average banking efficiency value for the period 2018–2023 based on BUKU and KBMI.

Year	BUKU 1	BUKU 2	BUKU 3	BUKU 4
2018	0.598	0.561	0.584	0.661
2019	0.607	0.587	0.622	0.686
2020	0.584	0.599	0.587	0.652
	KBMI 1	KBMI 2	KBMI 3	KBMI 4
2021	0.550	0.530	0.563	0.592
2022	0.527	0.512	0.550	0.578
2023	0.569	0.588	0.608	0.614

Different results are shown in the KBMI group. Although the KBMI 4 group has the highest average efficiency level at 0.595, followed by the KBMI 3 group with an average efficiency value of 0.574, these four groups do not differ significantly in a statistical sense. This means that the four KBMI groups, consisting of KBMI 1, KBMI 2, KBMI 3, and KBMI 4, have the same efficiency performance level in Table 4.

**Table 4.** Descriptive statistics of the efficiency of banks.

Group	N	Mean	Std Dev.	Min.	Max.	P25	P75
BUKU	1272	0.594	0.167	0.117	0.929	0.463	0.731
KBMI	1272	0.553	0.172	0.0953	0.921	0.412	0.698
Group BUKU							
BUKU 1	202	0.598	0.168	0.178	0.929	0.472	0.731
BUKU 2	681	0.583	0.167	0.117	0.86	0.456	0.72
BUKU 3	314	0.597	0.172	0.135	0.912	0.462	0.735
BUKU 4	75	0.666	0.132	0.412	0.818	0.59	0.775
Group KBMI							
KBMI 1	851	0.548	0.173	0.0953	0.921	0.412	0.692
KBMI 2	222	0.545	0.183	0.126	0.816	0.399	0.709
KBMI 3	151	0.574	0.16	0.139	0.807	0.431	0.703
KBMI 4	48	0.595	0.149	0.311	0.803	0.473	0.717

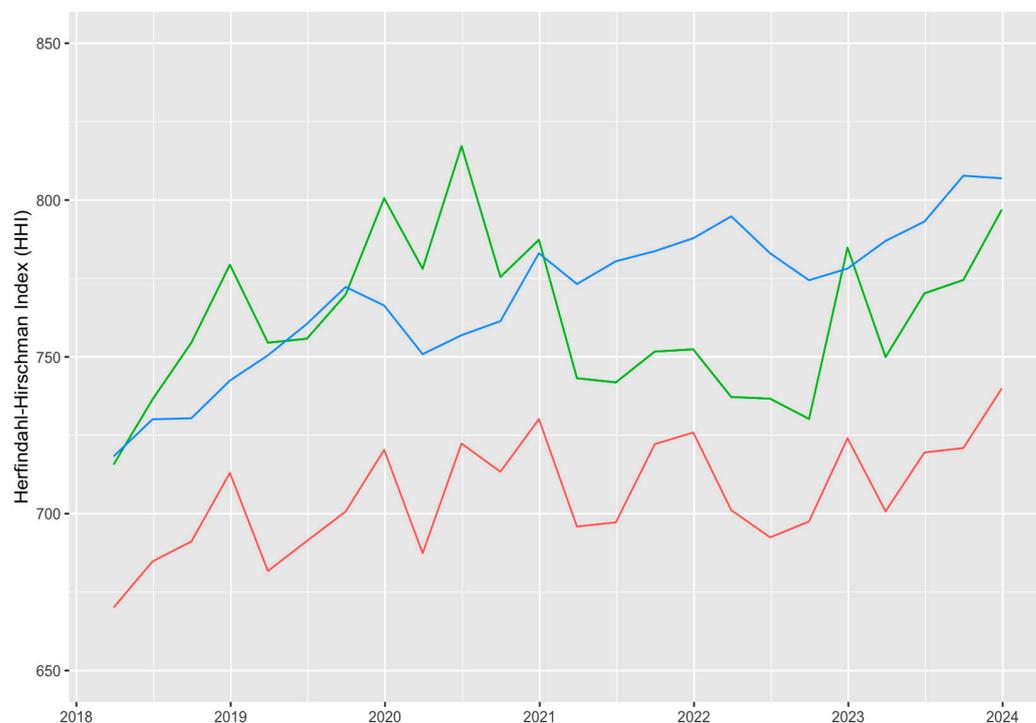
The banking sector plays a crucial role in the economic development of any country, and Indonesia is no exception. The efficiency of banks not only affects their operational performance but also impacts their competitiveness in the financial market. In this analysis, we will explore the relationship between the efficiency and competitiveness of banks in Indonesia, examining various factors that influence this relationship. The result in Table 5 analyzes the relationship between the efficiency and competitiveness of banks.

**Table 5.** Herfindahl–Hirschman Index description of the statistics.

Year	HHI Assets	HHI Third-Party Funds	HHI Credit (Loan)
2018	690 ± 17.9	747 ± 27.1	730 ± 9.86
2019	699 ± 16.5	770 ± 21.4	762 ± 9.29
2020	713 ± 18.6	790 ± 19.1	763 ± 14
2021	710 ± 15.9	747 ± 5.52	781 ± 6.17
2022	704 ± 14	747 ± 25.3	783 ± 8.86
2023	720 ± 16	773 ± 19.3	799 ± 10.3

Figure 2 displays the trend of the Herfindahl–Hirschman Index (HHI) from three variables, namely assets, third-party funds, and credit. Based on the third variable, the HHI in the 2018–2023 period is still below 1500, which shows that the market is not close, or it can be said that the market has effective competition. A market with an HHI of less than 1500 is considered a competitive marketplace, an HHI of 1500 to 2500 is moderately concentrated, and an HHI of 2500 or greater is highly concentrated. HHI based on asset

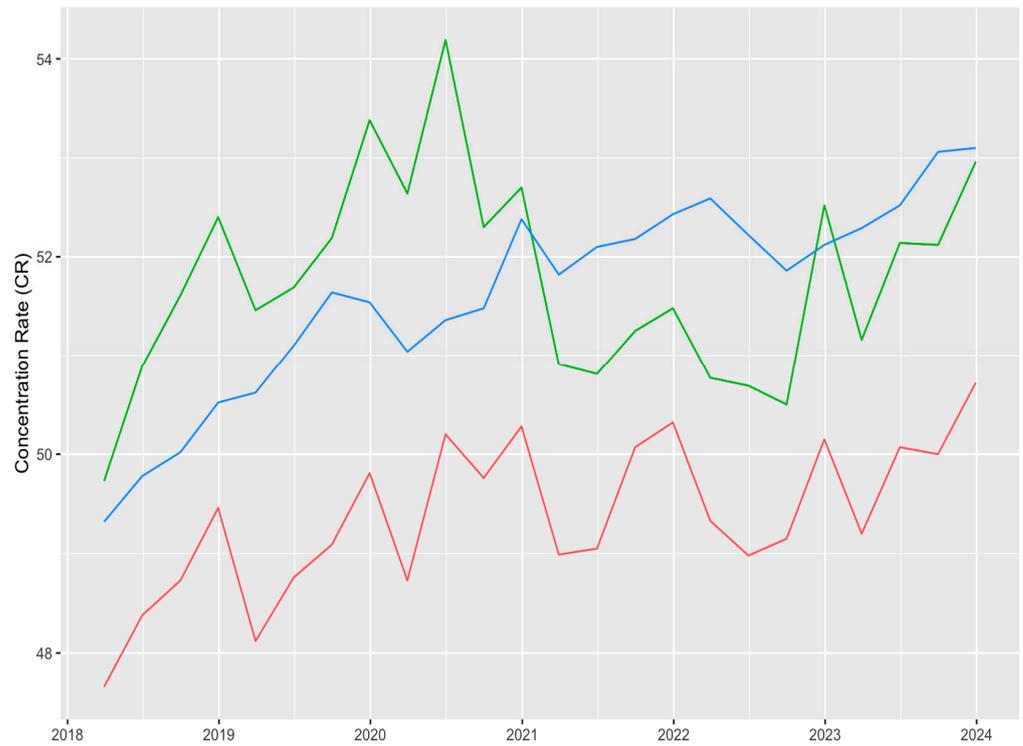
value tends to be consistent during the 2018–2023 period or increases slowly, in contrast to HHI based on third-party funds and credit. Based on Table 5, for third-party funds, the HHI increased from 2018 to mid-2020 but decreased until the end of 2022 and increased again in 2023. As for HHI credit, the HHI shows a positive trend or continues to increase in index value from 2018 to the end of 2023, reaching more than 800. However, the HHI is still below 1500.



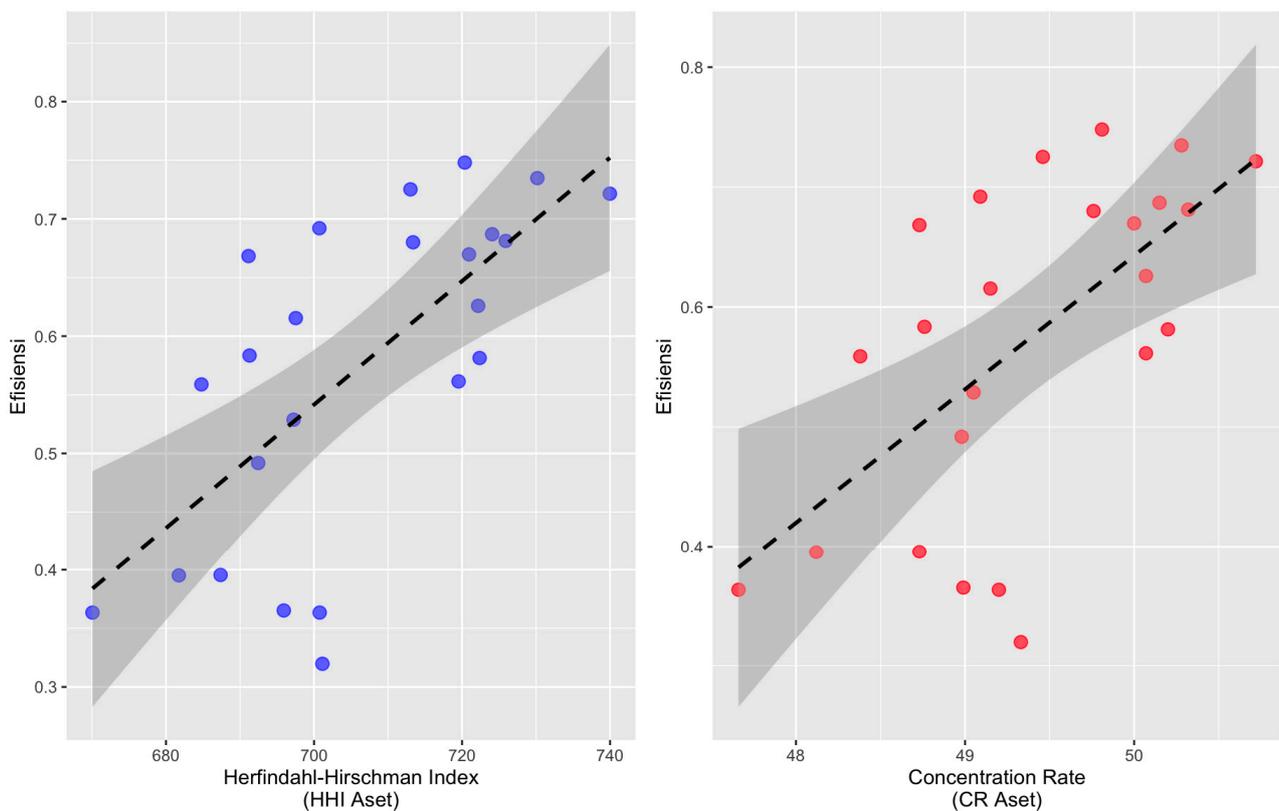
**Figure 2.** Trends in the Herfindahl–Hirschman Index (HHI) for the period 2018–2023. (Blue: HHI Assets, Green: HHI Third-Party Funds, Red: HHI Credit).

Exploration of bank competitiveness was also carried out by measuring the concentration rate (CR) based on the top four banks with the largest market share. The CR trend over the period 2018–2023 is shown in Figure 3. Concentration rate (CR) has a pattern that tends to be similar to the Herfindahl–Hirschman Index (HHI). Based on assets, CR has a positive trend which continues to increase slowly while credit CR continues to experience a significant increase until the end of 2023. A different trend is shown by the third-party funds variable, which experienced a decline in mid-2020 before then rising again, as occurs in the HHI. CR based on these three variables (assets, third-party funds, and credit) has a value in the range of 40–60, which is included in the lower-middle category or known as loose oligopoly or monopolistic competition, in contrast to the HHI, which indicates effective competition.

Figure 4 presents a visualization of the relationship or correlation between efficiency and competitiveness. Based on the two plots (HHI assets and CR assets), a positive relationship pattern is shown between the two variables of competitiveness and efficiency. This means that an increase in the competitiveness index using both the HHI and CR measurements will be followed by an increase in efficiency, and vice versa; as efficiency decreases or becomes smaller, competitiveness will decrease. The gray area in Figure 4 represents the confidence interval (variation as high or not).



**Figure 3.** Concentration rate (CR) trends for the period 2018–2023. ((Blue: HHI Assets, Green: HHI Third-Party Funds, Red: HHI Credit).



**Figure 4.** Correlation between efficiency and competitiveness.

Based on Table 6. The relationship between these variables can be significantly tested for its influence using a regression approach. In this test, the dependent variable is the

efficiency score, while the independent variables are total costs, core capital (tier 1), and bank category (BUKU and KBMI). The results of the analysis are presented in Table 6. Based on the analysis results, it was found that total costs, core capital (tier 1), and bank categories have a significant impact on efficiency. Total costs have a positive effect on efficiency, while core capital (tier 1) has a negative effect on efficiency. Based on Table 7, the magnitude of the influence of total costs and core capital (tier 1) on both the BUKU and KBMI groups is not significant. This means that both variables have a similar influence regardless of whether the banking institution is classified as BUKU or KBMI. This indicates that an increase in core capital (tier 1) will actually reduce a bank's efficiency, both in the BUKU and KBMI categories and their respective levels.

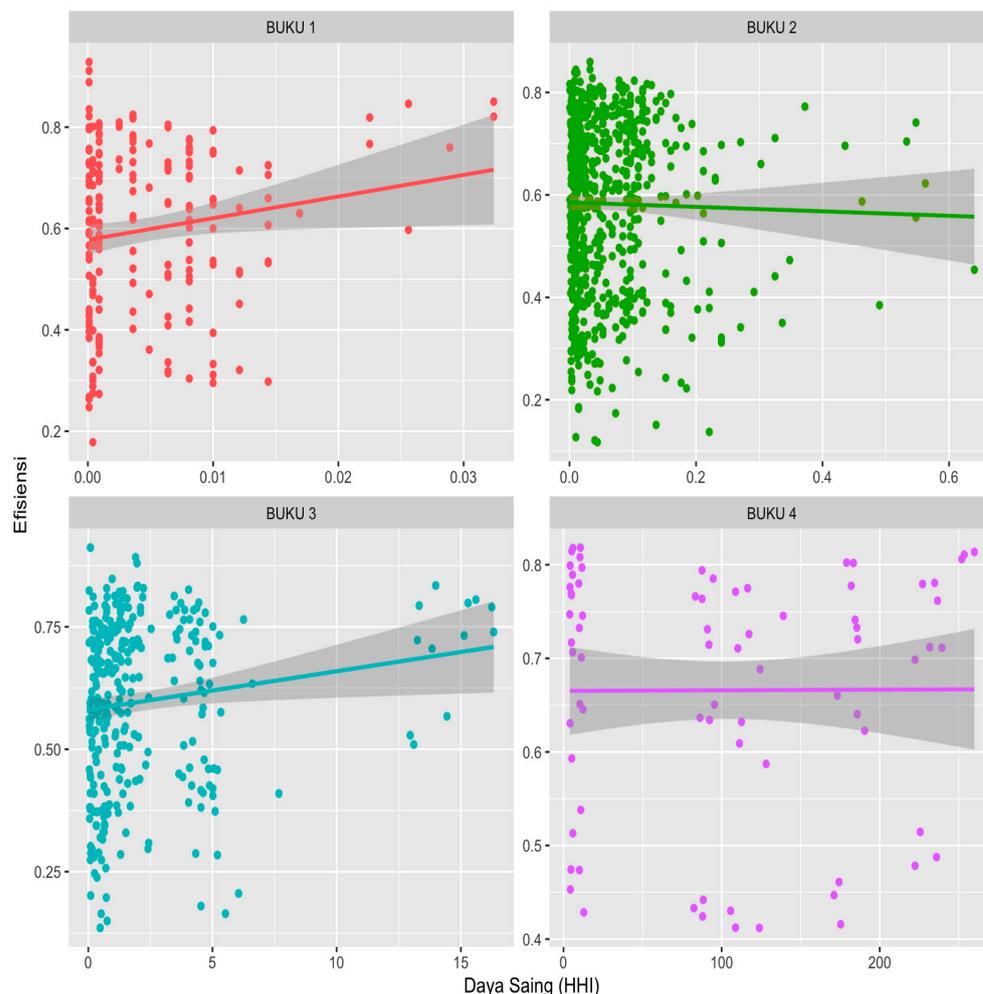
**Table 6.** Descriptive statistics of the concentration rate (CR).

Year	CR Assets	CR Third-Party Funds	CR Credit (Loan)
2018	48.6 ± 0.749	51.2 ± 1.13	49.9 ± 0.5
2019	48.9 ± 0.703	52.2 ± 0.856	51.2 ± 0.467
2020	49.7 ± 0.713	53 ± 0.84	51.6 ± 0.574
2021	49.6 ± 0.686	51.1 ± 0.309	52.1 ± 0.251
2022	49.4 ± 0.518	51.1 ± 0.94	52.2 ± 0.302
2023	50 ± 0.623	52.1 ± 0.736	52.7 ± 0.401

**Table 7.** The influence of core capital (tier 1) and bank category on efficiency.

Variable	Efficiency	Efficiency
Constant	0.353 (0.07)	0.272 (0.08)
BUKU 2	−0.031 (0.01)	KBMI 2 (0.01)
BUKU 3	−0.050 (0.02)	KBMI 3 (0.02)
BUKU 4	−0.032 (0.03)	KBMI 4 (0.03)
Modal Inti (Tier 1)	−0.127 (0.01)	−0.123 (0.01)
Total Cost	0.159 (0.00)	0.158 (0.00)
Num. Obs.	1265	1263
R2	0.62	0.654
R2 Adj.	0.618	0.652

This section presents the impact of core capital on efficiency based on data exploration related to the relationship or correlation between core capital (tier 1) and efficiency scores. In the exploration of that relationship, it is divided into two categories, namely BUKU and KBMI. Figure 5 presents the relationship between core capital (tier 1) and efficiency scores in the BUKU segmentation, while Figure 2 presents the relationship between core capital (tier 1) and efficiency scores in the KBMI group category. In the BUKU 1 group, a linear and positive relationship is observed between core capital (tier 1) and the efficiency score, although it is not very significant. This indicates that the higher the core capital (tier 1), the greater the efficiency of a bank will be. The BUKU 2 and BUKU 3 groups show a different pattern from BUKU 1, where BUKU 2 and BUKU 3 have a relationship with a negative linear tendency, meaning that when the core capital becomes higher or larger (tier 1), the efficiency tends to decrease. Unlike the BUKU 1 to BUKU 3 groups, the BUKU 4 bank group also has a random pattern of a relationship between core capital (tier 1) and efficiency. In other words, there is no linear relationship pattern between the two variables of core capital (tier 1) and efficiency.



**Figure 5.** Correlation between competitiveness and efficiency of the BUKU group.

The policy of changing the category of BUKU banks to KBMI is also measured by the change in the pattern of the relationship between core capital (tier 1) and the efficiency score. In the KBMI 1 group, there is no linear or significant relationship between the increase in core capital (tier 1) and efficiency, which is different from the BUKU status that tends to increase. In the KBMI 2 category, the obligation to increase core capital (tier 1) actually shows a decrease in a bank's efficiency. In the BUKU 2 category, the negative linear relationship is not very significant or steep, but in KBMI 2, it shows a fairly sharp negative relationship. This means that the higher the core capital (tier 1), the more the efficiency of a bank decreases.

The KBMI 3 and KBMI 4 groups show different performances compared to the previous two groups. These two groups can show a positive relationship between the increase in core capital (tier 1) and efficiency. This means that in these two groups, an increase in core capital (tier 1) will make the banks within them more efficient. The relationship between these variables can be significantly tested for its influence using a regression approach. In this test, the dependent variable is the efficiency score, while the independent variables are total costs, core capital (tier 1), and bank category (BUKU dan KBMI). Based on Table 8 the results of the analysis are presented in Table 5. Based on the analysis results, it was found that total costs, core capital (tier 1), and bank categories have a significant impact on efficiency. Total costs have a positive impact on efficiency, while core capital (tier 1) has a negative impact on efficiency. The magnitude of the influence of total costs and core capital (tier 1) on both the BUKU and KBMI groups is not significant. This means that both variables have a similar influence regardless of whether the bank is classified as BUKU or KBMI. This indicates that an increase in core capital (tier 1) will actually reduce a bank's

efficiency, both in the BUKU and KBMI categories and their respective levels, based on Table 6. The significance of the model is indicated by the  $f$  and  $p$  values ( $p$  value < 0.05).

**Table 8.** Correlation between core capital (tier 1) and KBMI group efficiency.

Variable	Efficiency		Efficiency
Constant	0.353 (0.07)		0.272 (0.08)
BUKU 2	−0.031 (0.01)	KBMI 2	−0.011 (0.01)
BUKU 3	−0.050 (0.02)	KBMI 3	−0.050 (0.02)
BUKU 4	−0.032 (0.03)	KBMI 4	−0.085 (0.03)
Core capital (Tier 1)	−0.127 (0.01)		−0.123 (0.01)
Total Cost	0.159 (0.00)		0.158 (0.00)
Num. Obs.	1265		1263
F value	410.1		474.7
$p$ value	<0.01		<0.01
R2	0.62		0.654
R2 Adj.	0.618		0.652

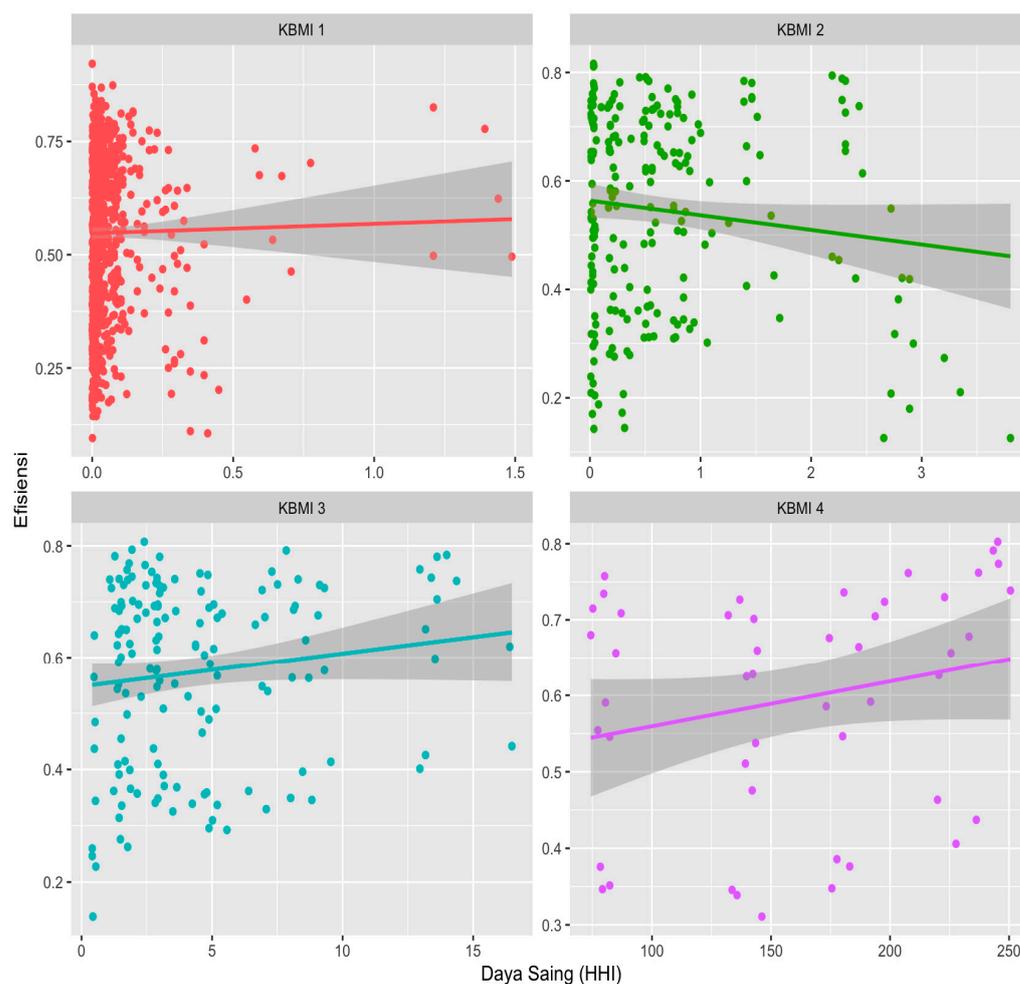
The exploration of the relationship between bank efficiency and competitiveness is displayed in the scatter plot below. Group BUKU 1 shows that competitiveness is directly proportional to efficiency. The same is observed in group BUKU 3. Meanwhile, in group BUKU 2, there is no significant relationship pattern, but there is a slight tendency towards a negative relationship, meaning that increased competitiveness will actually reduce a bank's efficiency in this group. No relationship between competitiveness and efficiency is observed in group BUKU 4.

There are no significant changes in patterns within the BUKU and KBMI groups. However, in the KBMI 4 group, a positive correlation between competitiveness and efficiency is observed, meaning that an increase in efficiency will be followed by an increase in a bank's competitiveness. This group has the same pattern as the KBMI 1 and KBMI 3 groups. Meanwhile, the KBMI 2 group still follows the same pattern as in the BUKU 2 group, where an increase in efficiency is accompanied by a decrease in competitiveness, and vice versa; an increase in competitiveness will be followed by a decrease in a bank's efficiency Based on Figure 5.

Based on the Figure 6, the relationship or correlation between core capital (tier 1) and competitiveness will also be displayed in the analysis. Figure 5 shows the relationship between core capital (tier 1) and competitiveness in the BUKU group, while Figure 6 shows the relationship between core capital (tier 1) and competitiveness in the KBMI bank group. Simultaneously, both in the BUKU 1 to BUKU 4 groups, a positive linear relationship between core capital (tier 1) and competitiveness is observed. An increase in core capital (tier 1) in a bank will be followed by an increase in the bank's competitiveness. Conversely, a decrease or minimal core capital (tier 1) will reduce or diminish a bank's competitiveness.

Based on Figure 7. The very significant relationship pattern between the two variables is more evident in the BUKU 3 and BUKU 4 groups. Meanwhile, in the BUKU 1 and BUKU 2 groups, the trend is more gradual, meaning that the growth of core capital (tier 1) in these groups will increase competitiveness but not as extremely or significantly as in the BUKU 3 and BUKU 4 groups. The size of the bank itself becomes an important factor in terms of efficiency during a crisis. Jiménez-Hernández et al.'s (2019) research explains that banks with weak capital positions exhibit lower profitability and worse credit portfolio quality compared to others. This suggests that an increase in bank size enhances the bank's efficiency and specialization in loans and credits, thereby contributing to its overall

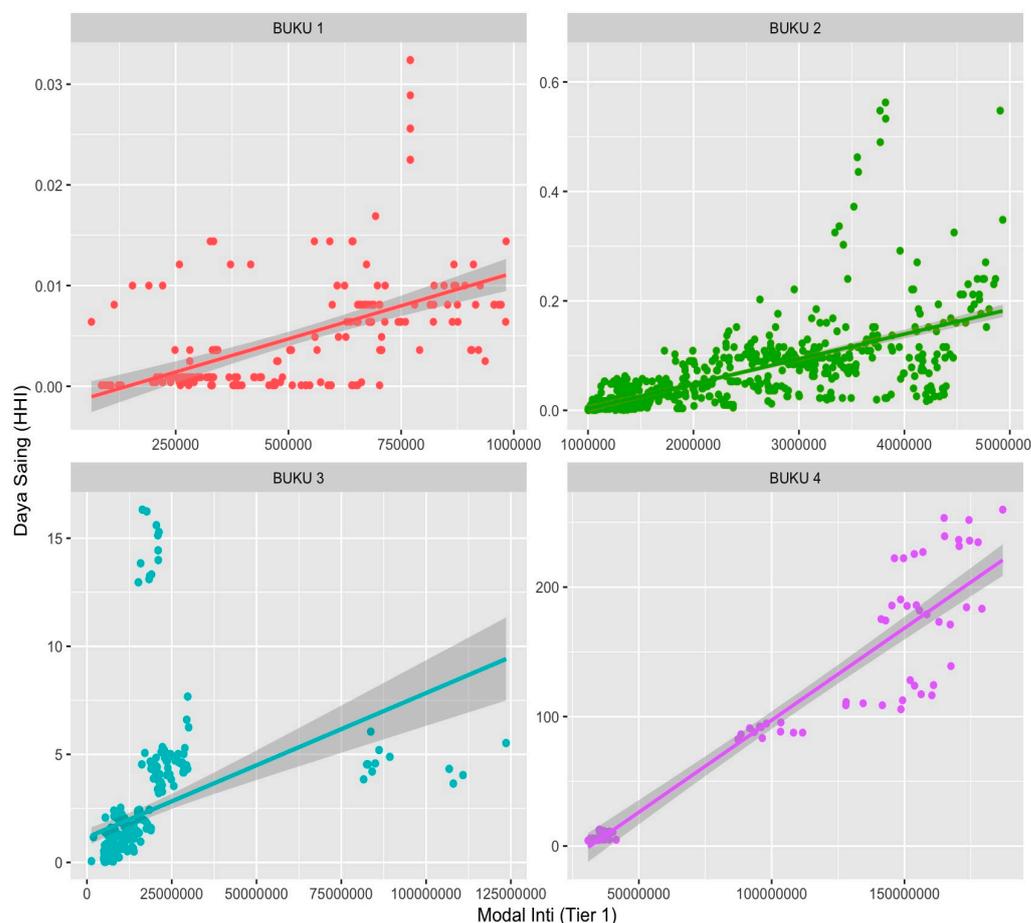
improvement in efficiency (Wen and Yu 2013). This study states that domestic banks seem to have an advantage in terms of efficiency, but these weak results may indicate that national banks and foreign banks do not show significant performance differences. Banks with better financial conditions also have higher efficiency levels; as explained by Xiang et al. (2015), banks in better financial conditions tend not to lose funds to loans, so they do not need to spend a lot of funds to recover loans. Therefore, to improve efficiency, banks need to increase their net income, reduce the amount of idle funds, lower operational costs, and invest more money in revenue-generating options. Svitalkova (2014) asserts that inadequate loan provisions and non-performing loans (NPLs) are the primary causes of banking inefficiency. Given their high vulnerability to macro shocks, banks must adapt to achieve maximum efficiency. Financial technology development has yielded numerous innovations that can enhance efficiency in the banking industry.



**Figure 6.** Correlation between competitiveness and efficiency of the KBMI group.

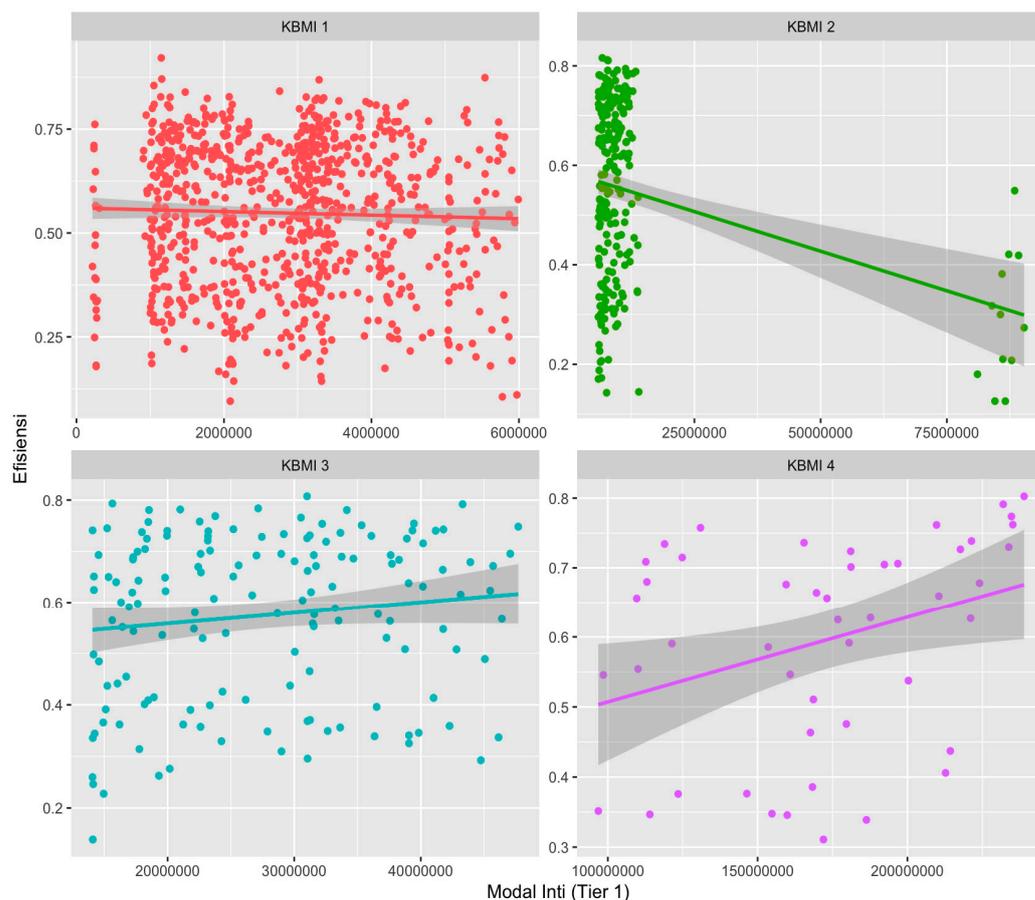
Sari et al.'s (2022) research, which explains that a bank's size does not significantly affect its performance, aligns with this study. The Tobit estimation results show that economic growth significantly harms the efficiency of commercial banks in Indonesia. When the economy grows, there is more demand for financial services, indicating that competition among private banks is tighter compared to government-owned banks and is influenced by the type of customers that the banking sector has. The competition between large and small banks continues to intensify, and companies must maintain their advantages in terms of products, services, and technology to remain relevant and competitive in the market. The competitive environment in the banking sector determines the type and

distribution of financial products and services to customers. That environment often encourages a wider range of choices for customers and prompts banks to take more risks.



**Figure 7.** Correlation between core capital (tier 1) and competitiveness (HHI) of the BUKU group.

Based on Figure 8, in the context of globalization and economic liberalization, competitiveness becomes an important factor in ensuring the survival and growth of banking. Banks that are able to maintain or enhance their competitiveness tend to be more successful in attracting customers and generating higher revenues. Therefore, countries with highly competitive financial markets tend to have lower barriers to accessing various institutions, products, and financial services, such as banking (Sari et al. 2022). Trung Pham et al.'s (2019) research shows that competition has a beneficial effect on banks by reducing financial costs and increasing the availability of financial products and services. On the other hand, the consolidation of banks' positions in the market can lead to the formation of monopoly power, resulting in high interest rates and inadequate access to credit (Sari et al. 2022). Competitiveness is also crucial in gaining the trust of the public and investors. Banks with strong competitiveness can demonstrate excellent financial performance and have the ability to survive amidst intense competition. In a more competitive market, banks will face several challenges, including increased credit risk due to their tendency to offer higher-risk loans to attract new customers or retain existing ones. This can lead to an increase in credit risk, which could potentially result in bad debts or defaults, increase operational costs for customer acquisition, and ultimately reduce banking profits (Sari et al. 2022).



**Figure 8.** Correlation between core capital (tier 1) and KBMI group efficiency.

Several factors influence efficiency, including the integration of technology in banking operations such as online banking and automated teller machines (ATMs), which have significantly improved efficiency. Banks that invest in technology can reduce operational costs and enhance service delivery. The regulatory framework in which banks operate can either facilitate or hinder efficiency (Ullah et al. 2023). Regulations that require transparency and accountability can lead to better management practices, while excessive regulation may impose unnecessary costs. In addition, one of the factors influencing competitiveness is the number of players in the banking sector that affect competition (Tan 2016). In a highly concentrated market, a few banks dominate, which can lead to higher prices for consumers. Conversely, a competitive market with many players can drive innovation and lower costs. Moreover, understanding customer needs and preferences is essential for banks to remain competitive. Banks that offer tailored products and a superior service are more likely to attract and retain customers (Kuckertz et al. 2020).

Banks that operate efficiently can offer lower fees and better interest rates, making them more appealing to customers. This efficiency can translate into a competitive advantage, allowing banks to capture a larger market share. For example, a bank with a low cost-to-income ratio can afford to offer more attractive loan rates compared to less efficient competitors. Conversely, competitive pressures can drive banks to become more efficient. In a competitive environment, banks must continuously seek ways to reduce costs and improve performance in order to stay relevant (Omarini 2022). This can lead to innovations in processes and the adoption of new technologies that enhance operational efficiency (Ali et al. 2022).

To illustrate, Bank Mandiri, one of the largest banks in Indonesia, has made significant strides in enhancing its efficiency through the adoption of digital banking technologies. By investing in online banking platforms and mobile applications, Bank Mandiri has

streamlined its operations, reduced transaction costs, and improved customer service. The bank has also implemented data analytics to optimize its product offerings and understand customer preferences better (Shah et al. 2022). Besides that, Bank Rakyat Indonesia (BRI) is known for its focus on microfinance and has improved its efficiency by leveraging technology to reach rural customers. BRI has deployed mobile banking services and digital loan applications, which have reduced the need for physical branches. This shift has allowed the bank to lower operational costs while maintaining a strong presence in underserved areas (Mujianto et al. 2022).

Moreover, a private bank such as BCA has successfully enhanced its efficiency by automating various banking processes and investing in state-of-the-art IT infrastructure. The bank's robust internet banking system provides customers with a wide range of services while minimizing the need for in-branch visits. BCA's focus on customer experience and operational efficiency has helped it maintain a competitive edge in the market. And also, CIMB Niaga has adopted various strategies to improve its efficiency, including process re-engineering and the introduction of digital banking solutions. The bank has streamlined its loan approval processes and enhanced its risk management systems, resulting in faster service delivery and reduced costs (Ramaditya et al. 2023). Additionally, CIMB Niaga has focused on employee training to boost productivity and service quality.

Khalifatufofi'ah (2018) explains that in general, capital, financing, and interest rates are very important for the financial performance of banking. The amount of capital and financing will affect the total assets. Conversely, the higher the interest rates set by the bank, the lower the public's desire to take out financing, which will decrease the assets in banking. The high interest rate will cause the level of banking profits to increase, but on the other hand, the bank does not have sufficient capacity to face challenges in various economic conditions. So, an efficient bank is one that can provide products and services at a lower cost. This study supported Sari et al. (2022) in their research, where they explain that the size of the bank does not significantly affect its performance. The Tobit estimation results show that economic growth is very detrimental to the efficiency of commercial banks in Indonesia. The demand-following hypothesis states that the financial sector grows because the real sector requires more of its services (Kozak 2021). However, the relationship between economic growth and bank efficiency indicates that this is not true. In other words, when the economy grows, there is more demand for financial services. This shows that business competition in private banks is tighter compared to government-owned banks, where these factors are also influenced by the type of customers that the banks have.

#### 4. Conclusions

The relationship between efficiency and competitiveness in the banking sector of Indonesia is complex and multifaceted. Efficient banks tend to outperform their competitors by offering better products and services, while competitive pressures can incentivize banks to enhance their efficiency. Understanding this relationship is vital for stakeholders in the banking industry, including policymakers, bank managers, and investors, as it can inform strategies to improve performance and drive economic growth in Indonesia. By mapping and analyzing these dynamics, we can gain insights into how banks can thrive in a challenging economic environment, ultimately benefiting the wider economy.

The results found there are no significant changes in the patterns within the BUKU and KBMI groups. However, in the KBMI 4 group, a positive correlation between competitiveness and efficiency is observed, meaning that an increase in efficiency will be followed by an increase in a bank's competitiveness. This group has the same pattern as the KBMI 1 and KBMI 3 groups. Meanwhile, the KBMI 2 group still follows the same pattern as in the BUKU 2 group, where an increase in efficiency is accompanied by a decrease in competitiveness, and vice versa; an increase in competitiveness will be followed by a decrease in a bank's efficiency (Sadalia et al. 2018).

In the results, it was found that total costs, core capital (tier 1), and bank categories have a significant impact on efficiency. Total costs have a positive impact on efficiency, while

core capital (tier 1) has a negative impact on efficiency. The magnitude of the influence of total costs and core capital (tier 1) on both the BUKU and KBMI groups is not significant. This means that both variables have a similar influence regardless of whether the bank is classified as BUKU or KBMI. This indicates that an increase in core capital (tier 1) will actually reduce a bank's efficiency, both in the BUKU and KBMI categories and their respective levels. Future research could contribute to a deeper understanding of efficiency and competitiveness in different countries as a comparison after the COVID-19 pandemic.

The main and specific factors of Indonesian banking in the KBMI category show a significant influence on the transmission of bank profits in Indonesia. In monopolistic competition, supply and demand do not determine prices. Banking can sell similar but different products, allowing them to set prices. Product differentiation is a key feature of monopolistic competition, where products are marketed based on quality or brand. Demand is highly elastic, and any price change can cause demand to shift from one competitor to another in the banking sector. After analysis, it has been determined that the banking market in Indonesia is indeed a monopolistic competition market, and this has been empirically proven.

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