“The effect of banks’ cost efficiency and competition on liquidity creation”

AUTHORS	Viverita Viverita Dwi Nastiti Danarsari Yosman Bustaman Fadli Septianto

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Viverita Viverita (Indonesia), **Dwi Nastiti Danarsari** (Indonesia),
Yosman Bustaman (Indonesia), **Fadli Septianto** (Indonesia)

THE EFFECT OF BANKS' COST EFFICIENCY AND COMPETITION ON LIQUIDITY CREATION

Abstract

This study examines the role of a bank's cost efficiency and competition when creating liquidity. It also investigates the different abilities to create liquidity between conventional banks and Islamic banks. This study employs data from annual reports for 117 banks, including 103 conventional banks and 14 Islamic banks from the Association of Southeast Asian Nations 4 (ASEAN-4). Using the dynamic panel regression with the GMM system, this study finds that cost-efficient banks have a higher ability to create liquidity, while high banking competition deteriorates that ability. However, these effects decrease as banks manage their costs more efficiently. The findings imply that banks' ability to create liquidity is impacted by their market power to win the competition. Additionally, this study found that Islamic banks create more liquidity than conventional banks. This phenomenon indicates that by being more focused on activities using on-balance sheet items, Islamic banks are spared from risky off-balance sheet commitments. Furthermore, efficient banks are more able to generate liquidity in competitive markets.

Keywords conventional banks, Islamic banks, Lerner index, pandemic

JEL Classification G20, G21

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Viverita Viverita, Ph.D., Associate Professor, Faculty of Economics and Business, Department of Management, University of Indonesia, Indonesia. (Corresponding author)

Dwi Nastiti Danarsari, Dr., Assistant Professor, Faculty of Economics and Business, Department of Management, University of Indonesia, Indonesia.

Yosman Bustaman, Dr., Associate Professor, Faculty of Business and Communication, Swiss German University, Indonesia.

Fadli Septianto, MSc, Lecturer, Faculty of Economics and Business, Department of Economics, Sebelas Maret University, Indonesia.

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INTRODUCTION

Liquidity creation is the core of bank activities. It involves two main tasks. First, banks create liquidity for their consumers by converting liquid liabilities into illiquid assets on their balance sheets. Second, banks produce liquidity through loan commitment and other financial agreements on their off-balance sheets. Through these two prominent activities, banks act as risk transformers and liquidity creators. The ability of banks to create liquidity becomes important since it helps banks in providing funds to run the economy. Several previous studies have found determinants of liquidity creation, such as capital, size, and competition. In addition, previous studies revealed that the different business model between Islamic and conventional banks caused their different ability to create liquidity. Islamic banks must comply with Sharia law that prohibits riba, so they cannot engage in business involving interest rates, gambling, and speculations, derivative transactions, etc. Therefore, they have a limited ability to use their off-balance sheet activities to generate liquidity. However, there are still limited studies that consider the different behavior of the two bank's business models in creating liquidity.

Continuous deregulation and rapid technological changes in the last twenty years have changed the landscape of banking competition in Southeast Asia. Intensification of competition may lead to an increase in the welfare of bank customers. However, some studies reveal that competition spurred by government regulation impedes liquidity cre-

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ation. Additionally, cost efficiency is also an important factor that affects banks' ability to generate profitability, which may enhance banks' ability to serve as better financial intermediary institutions. Thus, this study examines the effects of cost efficiency and competition on banks' ability to create liquidity both in Islamic and conventional banks that have rarely been explored.

1. LITERATURE REVIEW AND HYPOTHESES

The main role of a bank is to generate liquidity by transforming the balance sheet risk over loan guarantee and other financial commitments in the off-balance sheet. This role does not differ between conventional banks (CBs) and Islamic banks (IBs); however, the different business models of the two may result in different amounts of liquidity being created. CBs can produce liquidity by transferring their deposits to finance loans and furthermore transform illiquid loans into safer deposits. These mechanisms positively affect the economic development (Berger & Sedunov, 2017). In contrast, Islamic bank practices must obey the Syariah principle that prohibits any transactions involving interest and promotes social welfare and equality. The different business model between Islamic banks and conventional banks may affect their ability to create liquidity. Previous studies by Berger et al. (2019) and Sahyouni and Wang (2019) found that Islamic banks consistently create more liquidity than those of conventional banks in various level of capital market developments and MENA countries. However, Viverita et al. (2023) found that Islamic banks generate less liquidity than those of conventional banks. Furthermore, those studies did not consider the effects of cost efficiency on a bank's liquidity creation. Based on these various findings, it is still necessary to explore the effects of other variables such as cost efficiency and competition on banks' ability to create liquidity.

The *financial fragility crowding out* hypothesis suggests that capital is an important factor in determining the bank's ability to generate liquidity. This theory suggests that banks with limited capital involuntarily generate more liquidity to avoid bank runs due to limited available financing. Diamond and Rajan (2000, 2001) and Diamond and Dybvig (1983) mentioned that this theory focuses on bank fragility and bank runs. Another factor is the bank's business model. Previous studies, such as Sahyouni and Wang (2019) and Mohammad (2014), find that Islamic banks create more liquidity per asset than conventional banks.

Efficiency is also important, given that banks are dominant sources of financing and provide credit to companies and households. Most of the literature on efficiency has examined the influence of efficiency on bank performance. For example, Rakshit and Bardhan (2022) reveal that more efficient banks are more profitable. In addition, similar findings are suggested by Bolarinwa et al. (2019), which showed that efficient banks tend to reduce bad loans, thereby leading to greater bank profitability. Another finding suggested that the impact of efficiency on profitability is stronger when banks undertake higher levels of risk and face higher degrees of competition (Fang et al., 2019). Furthermore, efficiency is also an important factor that affects banks' ability to generate profit (Bayeh et al., 2021) that may enhance banks' ability to serve as a better financial intermediary institution. This way more liquidity can be created. Previous studies on the effect of bank efficiency used the cost to gross total assets (Duan et al., 2021) and total factor productivity (Duan et al., 2021) measures.

Measuring the cost efficiency of a bank is important regarding its role as a financial intermediary institution. In fulfilling its role, a bank distributes its assets as loans to creditors. Thus, to maintain its relationship with creditors, a bank must be able to compete with its competitors by offering low loan rates that can only be secured by minimizing the costs or efficiently using the resources to produce loans (Rahman et al., 2017). The Stochastic Frontier Analysis (SFA) method is designed to measure the relative cost efficiency of a set of entities (e.g. banks) that produce the same output and are likely to be using the same generic inputs. This approach uses an econometric method to form such a frontier and measures each unit against this frontier (Berger & Mester, 1997). Only limited studies used the stochastic frontier analysis meth-

od (SFA) to measure the cost efficiency to accommodate the ambiguous errors in the panel data. For example, Rahman et al. (2017) investigated the impact of the cost efficiency of BRICS banks on bank capital. They found that cost-efficient banks generate higher capital. Furthermore, Jonas and King (2008) examined the effect of cost efficiency on its sensitivity towards monetary policy in the US. They found that higher cost-efficient banks are more sensitive to monetary shocks. Another study by Lin (2002) used SFA to measure the cost efficiency of merged banks in Taiwan and found that merger activities improve banks' cost efficiency. The current study by Rakshit and Bardhan (2022) examined applied SFA to measure the profit efficiency of Indian banks. They found that profit-efficient banks tend to generate more profits.

When banks operate efficiently, they improve their profitability, enhance the process of intermediation and pricing determination, and promote bank soundness, which then supports economic growth (Berger et al., 1993). Banks with higher efficiency perform better (Berger & DeYoung, 1997). Duan et al. (2021) explain that banks' capability to generate liquidity increases with their performance enhancement. Furthermore, the authors argue that, because liquidity creation is positively related to bank performance, banks with higher efficiency generate higher liquidity, since they can absorb more loss. Likewise, a cross-country study conducted by Duan et al. (2021) reveals that banks generate less liquidity when they are inefficient. However, although cost efficiency is an important factor for a bank as a financial intermediary institution, the role of competition in the relationship between cost efficiency and liquidity produced by banks is rarely explored. Thus, this paper would like to contribute to the literature on the role of cost efficiency in creating liquidity.

Scholars have also extensively investigated the theoretical association between competition and liquidity creation. The association between competition and liquidity creation is explained by two conflicting theories. First, banking competition lowers liquidity creation. This condition occurs because the high tension of competition reduces the profit margin and consequently lowers the banks' capability to take that risk (Jayaratne & Strahan, 1998). Lowering the risk-taking behavior in tight competition (Boyd & de Nicoló, 2005) indicates that banking reduces its expansion (Ippolito et al., 2016). Accordingly, the competition induces the bank to lower its risk by reducing its business expansion by reducing liquidity creation.

In contrast, another theory documents that competition in the banking system increases liquidity creation. Scholars suggest two mechanisms in which competition can enhance banks' ability to generate liquidity. The first comes from the ability of a bank to adopt and innovate its finances as well as improve its efficiency in a higher competition environment (Boot & Thakor, 2000; Laeven et al., 2015). Thus, by using its capacity to innovate their on- and off-balance sheet activities, banks could increase their ability to produce liquidity. Secondly, the intensifying competition forces banks to be more transparent and reduce abnormal behavior when recording loan loss provisions. This focus improves bank managers' efforts to control, screen, and monitor the loan portfolio (Jiang et al., 2016). This effort also helps lower risk and increases the expansion of the loan portfolio, subsequently increasing the capacity of the bank to increase liquidity creation.

Two rivalry hypotheses have emerged from this association. The first is *the fragility channel theory*. It suggests that an increase in competition will reduce creditors' ability to hold equity claims (Petersen & Rajan, 1995), and thus, decrease bank market power to attain relationships with new creditors which leads reduced liquidity formation (Horvath et al., 2016). When competition increases, it impacts and reduces bank profitability, which leads to a decreased portion of profit available to be shared as capital. Less profit moving into capital means less capital that can serve as a buffer to absorb any adverse shock (Boyd & de Nicoló, 2005; Jayaratne & Strahan, 1998). In response to this limitation, the bank reduces its deposit selling volume as well as loans granted to its customers and ultimately reduces the formation of liquidity. Such action is consistent with the prudential step wherein banks tend to reduce the probability of any bank run by depositors. Furthermore, Petersen et al. (1995) suggest that lending relationships play an important role in expanding credit in a tight competition environment, and thus, the supply of credit decreases. Banks tend to distrib-

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ute credit to existing customers who have already established long-term relationships with the bank. Thus, new customers have limited access to that funding.

The second hypothesis is *the price channel theory*. It stipulates that increased competition results in an increase in liquidity creation. Intensifying competition in the market results in tight price competition. The interest rate margin becomes thinner, and banks offer higher deposit rates but lower the price of loans, which leads to intensified competition in the market and tight price competition. When the interest rate margin becomes thinner, banks offer higher deposit rates but lower the price of loans. The relationship between interest rate and the volume of product sales is documented by Carbo-Valverde et al. (2009) and Love and Martínez Pería (2015), who found that increased competition encourages firms to gain more financing from banks to meet their external financing needs, thus reducing the financing constraint problem. This finding is in line with the findings of Hainz et al. (2013) who state that, in any tough competition, banks require less collateral, and then greater loan volumes can be distributed to firms and ultimately increase the function of banks to create liquidity.

Based on the previous literature, the purpose of the study is to investigate the effect of efficiency and competition on liquidity creation both in Islamic and conventional banks. Therefore, the hypotheses are as follows.

H1: Cost efficiency affects bank liquidity creation.

H2: Competition affects bank liquidity creation.

H3: Islamic banks create more liquidity than conventional banks.

2. DATA AND METHODS

To determine whether cost efficiency and competition affect liquidity creation, the present study used bank-level data. This study employed bank annual reports from 2008 to 2021. Data were drawn from the following sources:

1) Thomson Reuters Datastream;
2) Financial Service Authority database; and
3) Annual financial statements.

Furthermore, the bank-level data information from different resources was matched into the dataset. The sample included annual data from 103 conventional banks and 14 Islamic banks from ASEAN-4 countries. This study uses unbalanced panel data with 1,448 observations.

2.1. Empirical framework

To estimate the influence of cost efficiency and competition on banks' ability to create liquidity, this study applied dynamic panel data to accommodate both unobserved heterogeneity and endogeneity bias. This study applies the Generalized Methods of Moment (GMM) to control the simultaneity and possible correlation between the explanatory variables. Thus, all independent and control variables are at t-1.

Equation (1) presents the empirical model to analyze the effects of bank competition, cost efficiency, and control variables, i.e. capital, size, profitability, and macroeconomic variable GDP, a dummy variable for Islamic banks and the COVID-19 pandemic period using the cat-fat (when off-balance sheet activities included) liquidity creation measure. In addition, equation (2) used the same variables to examine the effects using the cat-non-fat (when the off-balance sheet activities are not included) liquidity creation measure.

The empirical specification is developed as follows:

$$\begin{aligned} LC_{Fi,t} =& \propto_{F1} + \propto_{F2} \cdot LC_{Fi,t-1} + \propto_{F3} \cdot CE_{i,t-1} \\ &+ \propto_{F4} \cdot COMP_{I,T-1} + \propto_{F5} \cdot Capital_{i,t-1} \\ &+ \propto_{F6} \cdot Size_{i,t-1} + \propto_{F7} \cdot ROA_{i,t-1} + \propto_{F8} \cdot GDP_{t-1} \\ &+ \propto_{F9} \cdot D_{IB} + \propto_{F10} \cdot D_{Pandemic} + \varepsilon_{i,t}, \end{aligned} \quad (1)$$

$$\begin{aligned} LC_{NFi,t} =& \propto_{NF1} + \propto_{NF2} \cdot LC_{NFi,t-1} \\ &+ \propto_{NF3} \cdot CE_{i,t-1} + \propto_{NF4} \cdot COMP_{i,t-1} \\ &+ \propto_{NF5} \cdot Capital_{i,t-1} + \propto_{NF6} \cdot Size_{i,t-1} \\ &+ \propto N_{F6} \cdot ROA_{i,t-1} + \propto_{NF8} \cdot GDP_{t-1} \\ &+ \propto_{NF9} \cdot D\_IB + \propto_{NF10} \cdot D\_Pandemic + \varepsilon_{i,t}, \end{aligned} \quad (2)$$

where *i* in equation (1) denotes the individual bank, *t* denotes the year, ∝ is the constant term, and subscript *F* denotes a measure of liquidity creation when off-balance sheet activities are included (*Cat Fat*). *CE* represents cost efficiency, *COMP* represents bank competition, capital represents equity to assets, size, and *ROA* represent the bank's specific factors, and *GDP* accommodates the country's fixed effect. *D_IB* and *D_Pandemic* represent dummy variables for Islamic banks and the pandemic period, respectively. The subscript *NF* in equation (2) denotes a measure of liquidity creation of *Cat-Non-Fat* (without the off-balance sheet liquidity included).

The models are estimated using the two-step system GMM to address the endogeneity problem and to ensure that the model demonstrates fit. Furthermore, to check the indication of over-identifying restriction, this study applies the Hansen J-test and Arrelano-Bond first- and second-order correlation.

2.1.1. Cost efficiency measure

Cost efficiency measures the distance between the optimal cost and its actual cost when generating an equal amount of output. This distance then gives a report on any inefficiencies in the process. This method uses the Stochastic Frontier Analysis (SFA) to estimate bank cost efficiency. Several banking efficiency studies apply this method (Berger et al., 2010; Bonin et al., 2005; Fungáčová et al., 2015). The SFA is preferable in measuring cost efficiency compared to the linear programming data envelopment analysis (DEA) method. This method accounts for the existence of errors such as random noise and inefficiency in creating the effective frontier. This method was originally proposed by Aigner et al. (1977) and Meeusen and Van den Broeck (1977).

This paper specified banking input and output using the intermediation approach. This method assumes that banks collect deposits and lend them with support from capital and labor. It considered 2 output factors in the function: Y_1 total loans and Y_2 investment assets. In addition, input prices consist of the price of capital (W_1): non-interest expense divided by fixed asset, price of funding (W_2): interest expense to total deposit, and price of labor (W_3): personnel expenses to total assets. Total cost is measured as the value of interest expenses and non-interest expenses. Based on the SFA model from Battese and Coelli (1995), this study measures cost efficiency by determining the translog cost function to establish the cost frontier by estimating the following formula (Berger et al., 2010; and Bonin et al., 2005).

$$\begin{aligned} Ln\left(\frac{TC}{w_3}\right) &= a + \sum_{i=1}^{4}\beta_i \ln Y_i + \sum_{k=1}\psi_i \ln\left(\frac{W_k}{w_3}\right) \\ &+ \frac{1}{2}\sum_{i=1}^{4}\sum_{j=1}^{4}\beta_{ij} \ln Y_i \ln Y_j \\ &+ \frac{1}{2}\sum_{k=1}\cdot\sum_{m=1}\psi_{km} \ln\left(\frac{W_k}{w_3}\right)\ln\left(\frac{W_m}{w_3}\right) \\ &+ \sum_{i=1}^{4}\sum_{k=1}\phi_{ik} \ln Y_i \ln\left(\frac{W_k}{w_3}\right) + u_{it} + v_{it}, \end{aligned} \tag{3}$$

where *TC* denotes Total Cost, y_i (i = 1, 2) denotes the i^{th} bank output, w_k (n = 1, 2) denotes the k^{th} input price, w_3 is the price of labor, u is the inefficiency term, and v is the random error. The total cost, price of capital, and price of funding by the price of labor are normalized to ensure homogeneity.

2.2. Bank competition indicator

Bank-level competition is measured using the Lerner Index (Bayeh et al., 2021; Efthyvoulou & Yildirim, 2014; Repkova, 2012). This index also measures bank inefficiency due to the discrepancy between the price and marginal cost. A higher index denotes a lower competition, and a lower index implies a tight competition. The index is written as follows:

$$Lerner_{i,t} = \frac{Price_{i,t} - MC_{i,t}}{P_{i,t}}, \tag{4}$$

where (*P*) represents the price of the total assets of bank *i* at time *t*. It is measured using the sum of interest income and non-interest income to total assets. Marginal cost (*MC*) is measured using the following function (Repkova, 2012):

$$\begin{aligned} \ln TC &= a + a_1 \ln y + \frac{1}{2}a_2\left(\ln y\right)^2 \\ &+ \sum_{j=1}^{3}\beta_j \ln w_j + \sum_{j=1}^{3}\sum_{k=1}^{3}\beta_{jk} \ln w_j \ln w_k \\ &+ \sum_{j=1}^{3}\gamma_j \ln y \ln w_j + \varepsilon, \end{aligned} \tag{5}$$

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Table 1. Operationalization variables

Variables	Variable description	Reference and sources
	Dependent variables	
LC_F (LC cat fat over gross total assets)	Total bank liquidity creation including both on- and off-balance sheet normalized by corresponding gross total assets of each bank	Berger and Bouwman (2009), Fu et al. (2016)
LC_{NF} (LC cat non- fat over gross total assets)	Total bank liquidity creation including both on- and off-balance sheet normalized by corresponding gross total assets of each bank	Berger and Bouwman (2009), Fu et al. (2016)
	Independent variables	
Capital	Bank capitalization measure, the ratio of equity capital over the total gross asset	Berger and Bouwman (2009), Fu et al. (2016), OJK data
Cost Efficiency (CE)	Bank cost efficiency score that estimated using stochastic frontier analysis. We employ total cost, 4 outputs (total loans, other earning assets, total deposits, liquid assets), and 3 inputs price (non-interest expense/fixed asset, interest expense/total deposit, labor cost/total asset) to create translog cost function	Berger et al. (2010), Bonin et al. (2005)
Size	The natural logarithm of bank gross total asset of each individual bank	Berger and Bouwman (2009), Fu et al. (2016), OJK data
Competition	$Lerner_{i,t} = \frac{Price_{i,t} - MC_{i,t}}{P_{i,t}}$	Bayeh et al. (2021), Efthyvoulou and Yildirim, (2014), Repkova (2012)
Profitability	Bank profitability measurement using ROA	Duan and Niu (2020)
GDP Growth	Monthly GDP growth	The World Bank
D-Pandemic	A dummy variable equal to 1 during pandemic, starting from March 2020	Susamto et al. (2023)
D-Bank Type	A dummy variable equal to 1 for the IB type of Bank, 0 for CBs	Boubakri et al. (2023)

where TC denotes the total cost, y is the bank's total assets, w_j is the j^{th} input price (n = 1,2,3), and ε *is* the random error. The price of capital is expressed by w_1, while w_2 is the price of the fund, and w_3 is the price of labor. Total cost is the sum of non-interest expenses and interest expenses. Finally, the marginal cost is estimated by the coefficients of the cost function. Table 1 presents the variables used in the study.

3. RESULTS

Table 2 presents correlation matrix between variables to test the existence of multicollinearity.

Results in Table 2 show that there is no strong correlation between independent variables since all the values of the correlation are less than 0.7. Thus, it can be concluded that there is no multicollinearity problem in the model.

Table 3 describes the descriptive statistics of the data, which consist of the mean, standard deviation, and minimum and maximum values. The table presents all the data in the sample. As shown, the average value and variance of liquidity creation fat (LCFAST) and liquidity creation non-fat (LCNFAST) are 0.661 and 0.2776; 0.5132 and 0.2130, respectively. The mean and standard deviation of cost efficiency (CE) and competition (Lerner) are 0.8442 and 0.1307; 0.3002 and 0.2390, respectively. The average score of cost efficiency of 0.8442 indicates that the bank uses 84.42% of its resources efficiently. In other words, the bank wastes 15.58% of its costs relative to a best-practice bank.

Table 2. Correlation matrix

Variables	LCFAST	LCNFAST	CE	Capital	Size	COMP	ROA	GDP
LCFAST	1	–	–	–	–	–	–	–
LCNFAST	0.4792	1	–	–	–	–	–	–
CE	0.2124	0.4497	1	–	–	–	–	–
Capital	–0.2887	–0.294	–0.1489	1	–	–	–	–
Size	0.2185	0.2761	0.1751	–0.4672	1	–	–	–
COMP	0.084	–0.159	0.1454	–0.0549	0.1953	1	–	–
ROA	–0.0014	–0.0599	0.0357	0.1064	0.0782	0.2909	1	–
GDP	–0.0087	–0.0501	0.1052	0.0097	–0.159	–0.0068	0.0188	1

Table 3. Descriptive statistics of the variables

Variables	Mean	Minimum	Maximum	Standard deviation
LCFAST	0.6610	–0.9157	6.5262	0.2776
LCNFAST	0.5132	–0.9157	1.0724	0.2130
Size	14.5931	9.5884	18.6847	1.8779
Capital	0.1490	–0.2749	1.1633	0.1137
COMP	0.3002	–4.7126	0.8215	0.2390
CE	0.8442	0.0178	0.9830	0.1307
ROA	0.0089	–1.3035	0.1221	0.0373
GDP	0.0443	–0.0952	0.0751	0.0277

3.1. Regression results

This study employs dynamic panel regression with a GMM system estimator. Table 4 provides the estimation outcome of the impact of cost efficiency on liquidity creation. The Arellano Bond test for AR (2) indicates that the model meets the requirement for no autocorrelation. Furthermore, the p-value of the Hansen test result indicates that the instruments as a group are exogenous. Table 4 demonstrates that the model, using both measures the cat-non-fat and cat-fat have a significant F value at the 1% level.

As presented in Table 4, the regression results in columns (1) and (2) show that bank cost efficiency has a positive and significant impact on liquidity creation, both in the cat-non-fat and cat-fat liquidity creation measures. These findings confirm hypothesis 1 states that cost efficiency affects liquidity creation. Furthermore, bank competition measured by the Lerner Index has a negative impact on liquidity creation, but the impact is significant only in the cat-non-fat measure and insignificant in the cat-fat measure. These results are somewhat consistent with hypothesis 2 that competition affects bank liquidity creation. This finding indicates that banks focus on their interest income more than non-interest income and are less able to generate liquidity since there are limited sources of income that can be distributed as loans. This study demonstrates a positive impact of the interaction variable of efficiency and competition. This finding suggests that banks that operate with minimum cost will reduce the negative effect of competition on their ability to generate liquidity. Moreover, this study finds that both bank capital and profitability have a negative and significant impact on liquidity creation. Bank size also has a positive effect on liquidity creation, but the impact is insignificant. This study also finds that the dummy variable of Islamic banks has a positive effect on liquidity creation, but the impact is insignificant cat-fat to measure liquidity creation. This result indicates that Islamic banks create more liquidity than those of conventional banks, which confirmed hypothesis 3.

Table 4. Impact of efficiency on liquidity creation

Variable	Cat-non-fat	Cat-fat
LCt-1	0.0384	0.3254***
	(0.1800)	(0.0000)
CE	0.4361**	0.7345***
	(0.0160)	(0.0030)
COMP	–0.8296***	–0.2912
	(0.0040)	(0.4840)
Efficiency* Competition	0.9563***	0.4808
	(0.0090)	(0.3670)
Capital	–0.9119***	–0.8090***
	(0.0000)	(0.0000)
Size	–0.0015	–0.0089
	(0.8350)	(0.1880)
ROA	–2.6459**	–4.1060***
	(0.0170)	(0.0030)
GDP	–0.1157	0.1290
	(0.31600	(0.3410)
D-Islamic bank	0.0874*	0.0146
	(0.0940)	(0.8090)
D-Pandemic	–0.0178	0.0179
	(0.2610)	(0.3680)
Constant	0.3268	0.0644
	(0.1550)	–0.8130
AR (1)	0.0020	0,0000
AR (2)	0.2350	0.2790
Hansen	0.1250	0.0560
F	464.9100	1296.6700
Prob. F	0.0000	0.0000

Note: * indicates a 10% significance level, while ** and *** indicate 5% and 1% significance levels, respectively.

4. DISCUSSIONS

The results of this study imply that cost-efficient banks produce more liquidity. This result implies that if a bank can manage its assets with minimum costs, it can maximize its intermediation

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role and generate more liquidity. This result is consistent with Duan et al. (2021), who imply that management's ability to reduce costs enhances a bank's liquidity creation, whether the bank used its loan commitments and other non-balance sheet activities or proceeded without any non-balance sheet activities. Furthermore, this study reveals that bank competition reduces liquidity creation. This relationship can be explained using the price channel theory, which implies that high competition will affect banks' pricing policy, especially they will reduce the price of loan and increase the price of deposit, which leads to increasing demand for loans and deposits. competitive banks create lower liquidity. This finding is consistent with Viverita et al. (2023) when examining the liquidity creation of the Indonesian banks. As Horvath et al. (2016) suggested, banks operating in a highly competitive environment adjust their pricing policy by reducing loan rates and increasing deposit rates, which leads to an increase in demand for both loans and deposits. These findings are consistent with Fu et al. (2016) for Asia-Pacific banks. However, the effect is not significant when using the cat-fat measure. The insignificant impact is mainly driven by on-balance-sheet items. Additionally, this study reveals the important role of bank efficiency in reducing the influence of competition on banks' ability to generate liquidity. Thus, efficiency reduces the negative influence of competition on liquidity creation.

This study reveals that bank capital has a negative and significant impact on liquidity creation. The negative effect of capital is consistent with the financial fragility hypothesis (Diamond & Rajan, 2000). This theory suggests that banks with a higher capital have limited ability to provide liquidity to the market, since the investors who put their money in a bank as capital cannot run on the bank thus minimizing liquidity creation. In addition, this study finds profitable banks can produce more liquidity since they may offer higher deposit rates and increase demand for loans.

Furthermore, this study finds that Sharia-compliant banks (IBs) generate more liquidity than conventional banks (CBs). However, that effect is not significant when using cat-fat to measure liquidity creation. This result might be due to the more dominant role of on-balance-sheet activities within the Sharia business model, which rarely deals with off-balance-sheet commitments. In terms of any difference in efficiency between IBs and CBs, Ikra et al. (2021) argue that IBs have a lower portfolio of loan loss provisions, which might lead to different abilities for liquidity creation.

CONCLUSION

This study evaluates the role of cost efficiency and competition in bank liquidity creation and analyzes the ability of CBs and IBs for liquidity creation. The results reveal that a cost-efficient bank generates more liquidity. This finding implies that banks need to efficiently manage their intermediary costs to create higher liquidity. In terms of competition, higher competition decreases banks' ability to create liquidity, which implies that banks with high market power produce more liquidity. Moreover, the results indicate that efficiency weakens the influence of competition on banks' ability to generate liquidity. Eventually, it has been found that IBs create better liquidity than CBs, which sheds light on the role of IBs' unique characteristics that must comply with the Sharia law, which may reduce their risky activities. Moreover, this study indicates the important role of banks' market power in creating liquidity and the significant effect of banks' cost efficiency in generating liquidity in a competitive environment. In addition, this study suggests banks control their level of customer deposits in capital since it will lessen their ability to create liquidity.

AUTHOR CONTRIBUTIONS

Conceptualization: Viverita Viverita, Dwi Nastiti Danarsari, Yosman Bustaman, Fadli Septianto.
Data curation: Viverita Viverita, Yosman Bustaman, Fadli Septianto.
Formal analysis: Viverita Viverita, Yosman Bustaman, Dwi Nastiti Danarsari.

Funding acquisition: Viverita Viverita.
Investigation: Fadli Septianto.
Methodology: Viverita Viverita.
Project administration: Viverita Viverita, Dwi Nastiti Danarsari
Resources: Fadli Septianto.
Software: Yosman Bustaman, Fadli Septianto.
Supervision: Viverita Viverita, Yosman Bustaman.
Writing – original draft: Viverita Viverita, Dwi Nastiti Danarsari, Yosman Bustaman, Fadli Septianto.
Writing – reviewing & editing: Viverita Viverita, Dwi Nastiti Danarsari, Yosman Bustaman, Fadli Septianto.

REFERENCES

1. Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and Estimation of Stochastic Frontier Production Function Model. *Journal of Econometrics, 6*(1), 21-37. https://doi.org/10.1016/0304-4076(77)90052-5
2. Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics, 20*(2), 325-332. https://doi.org/10.1007/BF01205442
3. Bayeh, A., Bitar, M., Burlacu, R., & Walker, T. (2021). Competition, securitization, and efficiency in US banks. *Quarterly Review of Economics and Finance, 80,* 553-576. https://doi.org/10.1016/j.qref.2021.04.004
4. Berger, A. N., & Bouwman, C. H. S. (2009). Bank Liquidity Creation Published by: Oxford University Press. Sponsor: The Society for Financial Studies. *Bank Liquidity Creation, 22*(9), 3779-3837. https://doi.org/10.1093/rfs/hhnl04
5. Berger, A. N., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. *Journal of Banking and Finance, 21*(6), 849-870. https://doi.org/10.1016/S0378-4266(97)00003-4
6. Berger, A. N., & Mester, L. J. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions? *Journal of Banking and Finance, 21*(7), 895-947. https://doi.org/10.1016/S0378-4266(97)00010-1
7. Berger, A. N., & Sedunov, J. (2017). Bank liquidity creation and real economic output. *Journal of Banking & Finance, 81,* 1-19. https://doi.org/10.1016/j.jbankfin.2017.04.005
8. Berger, A. N., Boubakri, N., Guedhami, O., & Li, X. (2019). Liquidity creation performance and financial stability consequences of Islamic banking: Evidence from a multinational study. *Journal of Financial Stability, 44,* 100692. https://doi.org/10.1016/j.jfs.2019.100692
9. Berger, A. N., Hasan, I., & Zhou, M. (2010). The effects of focus versus diversification on bank performance: Evidence from Chinese banks. *Journal of Banking and Finance, 34*(7), 1417-1435. https://doi.org/10.1016/j.jbankfin.2010.01.010
10. Berger, A. N., Hunter, W. C., & Timme, S. G. (1993). The efficiency of financial institutions: A review and preview of research past, present and future. *Journal of Banking and Finance, 17*(2-3), 221-249. https://doi.org/10.1016/0378-4266(93)90030-H
11. Bolarinwa, S. T., Obembe, O. B., & Olaniyi, C. (2019). Re-examining the determinants of bank profitability in Nigeria. *Journal of Economic Studies, 46*(3), 633-651. https://doi.org/10.1108/JES-09-2017-0246
12. Bonin, J. P., Hasan, I., & Wachtel, P. (2005). Bank performance, efficiency and ownership in transition countries. *Journal of Banking and Finance, 29*(1), 31-53. https://doi.org/10.1016/j.jbankfin.2004.06.015
13. Boot, A. W., & Thakor, A.V. (2000). Can Relationship Banking Survive Competition? *The Journal of Finance, 55*(2), 679-713. https://doi.org/10.1111/0022-1082.00223
14. Boubakri, N., Mirzae, Ali., & Saad. M. (2023). Bank lending during the Covid-19 pandemic: A comparison of Islamic and Conventional banks. *Journal of International Financial Markets, Institution, & Money, 84,* 101743. https://doi.org/10.1016/j.intfin.2023.101743
15. Boyd, J. H., & de Nicoló, G. (2005). The theory of bank risk taking and competition revisited. *Journal of Finance, 60*(3), 1329-1343. https://doi.org/10.1111/j.1540-6261.2005.00763.x
16. Carbo-Valverde, S., Udell, G. F., & Rodríguez-Fernández, F. (2009). Bank Market Power and SME Financing Constraints. *Review of Finance, 13*(2), 309-340. https://doi.org/10.1093/rof/rfp003
17. Diamond, D. W., & Dybvig, P. H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy, 91*(3), 401-419. https://doi.org/10.1086/261155
18. Diamond, D. W., & Rajan, R. G. (2000). A Theory of Bank Capital. *The Journal of Finance, 55*(6), 2431-2465. https://doi.org/10.1111/jofi.l2189
19. Diamond, D. W., & Rajan, R. G. (2001). Liquidity risk, liquidity creation, and financial fragility: A theory of banking. *Journal of Political Economy, 109*(2), 287-327. https://doi.org/10.1086/319552
20. Duan, Y., & Niu, J. (2020). Liquidity creation and bank profitability. *North American Journal of Economics and Finance, 54,* 101250. https://doi.org/10.1016/j.najef.2020.101250
21. Duan, Y., Fan, X., Li, X., Rong, Y., & Shi, B. (2021). Do efficient banks create more liquidity: international evidence. *Finance Research Letters,*

http://dx.doi.org/10.21511/bbs.19(1).2024.05

42, 101919. https://doi.org/10.1016/j.frl.2020.101919

22. Efthyvoulou, G., & Yildirim, C. (2014). Market power in CEE banking sectors and the impact of the global financial crisis. *Journal of Banking and Finance, 40*(1), 11-27. https://doi.org/10.1016/j.jbankfin.2013.11.010

23. El Moussawi, C., & Mansour, R. (2022). Competition, cost efficiency and stability of banks in the MENA region. *The Quarterly Review of Economics and Finance*, *84*, 143-170. https://doi.org/10.1016/j.qref.2021.12.005

24. Fang, J., Lau, C. K. M., Lu, Z., Tan, Y., & Zhang, H. (2019). Bank performance in China: A Perspective from Bank efficiency, risk-taking and market competition. *Pacific Basin Finance Journal, 56,* 290-309. https://doi.org/10.1016/j.pacfin.2019.06.011

25. Fu, X. M., Lin, Y. R., & Molyneux, P. (2016). Bank capital and liquidity creation in Asia Pacific. *Economic Inquiry, 54*(2), 966-993. https://doi.org/10.1111/ecin.12308

26. Fungáčová, Z., Shamshur, A., & Weill, L. (2015). Does bank competition reduce cost of credit? Cross-country evidence from Europe. *Journal of Banking and Finance, 83,* 104-120. https://doi.org/10.1016/j.jbankfin.2017.06.014

27. Hainz, C., Weill, L., & Godlewski, C. J. (2013). Bank Competition and Collateral: Theory and Evidence. *Journal of Financial Services Research, 44*(2), 131-148. https://doi.org/10.1007/s10693-012-0141-3

28. Horvath, R., Seidler, J., & Weill, L. (2016). How bank competition influences liquidity creation. *Economic Modelling, 52,* 155-161. https://doi.org/10.1016/j.econmod.2014.11.032

29. Huljak, I., Martin, R., & Moccero, D. (2020). Cost-Efficiency and Productivity of Euro-area banks. *SUERF Policy Note, 135,* 1-10. Retrieved from https://www.suerf.org/docx/f_6356d91dc6015575d84dc35e14ef20e3_10281_suerf.pdf

30. Ikra, S. S., Rahman, M. A., Wanke, P., & Azad, M. A. K. (2021, November 4). Islamic banking efficiency literature (2000-2020): a bibliometric analysis and research front mapping. *International Journal of Islamic and Middle Eastern Finance and Management, 14*(5), 1043-1060. https://doi.org/10.1108/IMEFM-05-2020-0226

31. Ippolito, F., Peydró, J. L., Polo, A., & Sette, E. (2016). Double bank runs and liquidity risk management. *Journal of Financial Economics, 122*(1), 135-154. https://doi.org/10.1016/j.jfineco.2015.11.004

32. Jayaratne, J., & Strahan, P. E. (1998). Entry restrictions, industry evolution, and dynamic efficiency: Evidence from commercial banking. *Journal of Law and Economics, 41*(1). https://doi.org/10.1086/467390

33. Jiang, L., Levine, R., & Lin, C. (2016). Competition and Bank Opacity. *Review of Financial Studies, 29*(7), 1911-1942. Retrieved from https://www.jstor.org/stable/43866070

34. Jiang, L., Levine, R., & Lin, C. (2019). Competition and Bank Liquidity Creation. *Journal of Financial and Quantitative Analysis, 54*(2), 513-538. https://doi.org/10.1017/S0022109018000820

35. Jonas, M. R., & King, S. K. (2008). Bank efficiency and the effectiveness of monetary policy. *Contemporary Economic Policy, 26*(4), 579-589. https://doi.org/10.1111/j.1465-7287.2008.00102.x

36. Laeven, L., Levine, R., & Michalopoulos, S. (2015). Financial innovation and endogenous growth. *Journal of Financial Intermediation, 24*(1), 1-24. https://doi.org/10.1016/j.jfi.2014.04.001

37. Lin, P. (2002). Cost Efficiency Analysis of Commercial Bank Mergers in Taiwan. *International Journal of Management*, *19*(3), 408-417. Retrieved from https://www.proquest.com/openview/4f6bf5ea896f13a5cf64958f7f135b3b/1

38. Love, I., & Martínez Pería, M. S. (2015). How bank competition affects firms' access to finance. *World Bank Economic Review, 29*(3), 413-448. https://doi.org/10.1093/wber/lhu003

39. Meeusen, W., & Van den Broeck, J. (1977). Technical Efficiency and Dimension of the Firm: Some results on the use of frontier production functionsy. *Empirical Economics, 2*(2), 109-122. https://doi.org/10.1007/BF01767476

40. Mohammad, S. (2014). *Liquidity Creation and Liquidity Risk Exposures in the Banking Sector: A Comparative Exploration between Islamic, Conventional and Hybrid Banks in the Gulf Corporation Council Region* (Thesis). Durham University. Retrieved from http://etheses.dur.ac.uk/10890/

41. Petersen, M. A., & Rajan, R. G. (1995). The Effect of Credit Market Competition on Lending Relationships. *The Quarterly Journal of Economics, 110*(2), 407-443. https://doi.org/10.2307/2118445

42. Rahman, M. M., Ashraf, B. N., Zheng, C., & Begum, M. (2017). Impact of cost efficiency on bank capital and the cost of financial intermediation: Evidence from BRICS countries. *International Journal of Financial Studies, 5*(4), 32. https://doi.org/10.3390/ijfs5040032

43. Rakshit, B., & Bardhan, S. (2022). An empirical investigation of the effects of competition, efficiency, and risk-taking on profitability: An application in Indian banking. *Journal of Economics and Business, 118,* 106022. https://doi.org/10.1016/j.jeconbus.2021.106022

44. Repkova, I. (2012). Market Power in the Czech Banking Sector. *Journal of Competitiveness, 4*(1), 143-155. https://doi.org/10.7441/joc.2012.01.11

45. Sahyouni, A., & Wang, M. (2019). Liquidity creation and bank performance: evidence from MENA. *ISRA International Journal of Islamic Finance, 11*(1), 27-45. https://doi.org/10.1108/IJIF-01-2018-0009

46. Susamto, A. A., Octavio, D. Q., Risfandy, T., & Wardani, D. T. K. (2023). Public ownership and local bank lending at the time of ovid-19 pandemic: Evidence from Indonesia. *Pacific-Basin Fiance Journal, 80,* 102072. https://doi.org/10.1016/j.pacfin.2023.102072

47. Viverita, V., Bustaman, Y., & Danarsari, D. N. (2023). Liquidity creation by Islamic and conventional banks during the Covid-19 pandemic. *Heliyon, 9*(4), e15136. https://doi.org/10.1016/j.heliyon.2023.e15136