

The Measurement of Efficiency and Productivity of Small Banks : Comparative Study in Central Java and Yogyakarta

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ABSTRACT

Research Aims: This study aims to analyse the efficiency and productivity of BPR and BPRS in Central Java and Yogyakarta with a total of 20 BPR in Central Java, 20 BPR in Yogyakarta, 20 BPRS in Central Java, and 12 BPRS in Yogyakarta.

Methodology: This study uses the BCC or VRS model as the basic model in analysing bank efficiency and productivity using Data Envelopment Analysis and Malmquist Productivity Index.

Research Findings: The results of this study show that almost all BPRs and BPRS in Central Java and Yogyakarta have not reached maximum efficiency and there are still many of these two types of banks that have low efficiency. The main cause of inefficiency of BPRs and BPRS in Central Java and Yogyakarta is caused by input and output variables, namely the amount of financing, operating income, and total fixed assets.

Originality: The study's originality lies in its comprehensive analysis of BPR and BPRS efficiency and productivity in Central Java and Yogyakarta, especially during the Covid-19 pandemic. The identification of factors contributing to inefficiency and the emphasis on technological change as a key productivity influencer provide valuable insights for practitioners, academics, and regulators.

Research limitation and implication: This study found that the dominant factor causing the productivity of a number of Islamic Commercial Banks in Indonesia was influenced by technological change factors. It is hoped that Islamic Commercial Banks in Indonesia can overcome the impact of technological change with new breakthroughs.

Keywords: Rural Bank, Islamic Rural Bank, Efficiency, Productivity

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INTRODUCTION

Covid-19, which first appeared in China in December 2019, has spread massively throughout the world. The impact of the Covid-19 pandemic not only affects health, but has also caused global economic costs. (Zheng dan Zhang, 2020). The spread of the virus and the government's preventive measures to minimise it are the main reasons for the halt in production and consumption activities. (Arianto, 2021). Likewise experienced by one of the

economic sectors, namely the banking industry, which is the heart of a country's economy. (Adeabah dan Andoh, 2020).

The banking industry is very important in the economic activities of a country (Putri & Marlius, 2018), which has the function of collecting public funds and channeling public funds. According to the type of bank can be divided into commercial banks and rural banks, including Sharia People's Financing Bank (BPRS). Islamic People's Financing Bank (BPRS) is one of the financial institutions that is able to carry out its role in serving medium, small and micro entrepreneurs. (Yusuf & Mahriana, 2016).

Based on Islamic banking statistics issued by the Financial Services Authority (OJK), the BOPO ratio of BPRS in 2016 increased to 87.09% compared to 2015 which was 88.09% (OJK, 2017). However, when viewed from the number of rural banks (BPR) and Islamic rural banks (BPRS) continues to decline. As of September 2021, the number of BPR and BPRS in Indonesia reached 1,646 units, consisting of 1,481 BPR and 165 BPRS. Along with the number of BPRS in Indonesia is decreasing. According to OJK, until 2021 the market share of BPRS to BPR is still 8.80 per cent and 2.49 per cent of the Islamic banking market share. As a research object, the development of BPR and BPRS in Central Java and Yogyakarta provinces has performed quite well compared to other provinces. BPR and BPRS in Central Java and Yogyakarta have good assets, financing, deposits, FDR, and NFP. The Financial Services Authority of Central Java Regional Office III noted that the performance of BPR and BPRS grew positively until March 2019. Likewise, the performance of BPR and BPRS in Yogyakarta grew positively despite the economic slowdown. This positive growth is certainly caused by several factors, one of which is caused by the efficiency and productivity of the bank. Analysis of efficiency and productivity is very important as a form of performance measurement and is one of the main factors in decision making. (Shang, 2005). By using 2 important components, namely available inputs to produce maximum output, which can be used as one of the main indicators in measuring competition (Hidayati, 2005). Especially during the Covid-19 pandemic, the measurement of banking efficiency and productivity is very important because banking efficiency is one of the benchmarks that underlies the overall banking performance.

Research on banking efficiency and productivity, especially on BPR and BPRS in Indonesia is still rarely done, but there are several researchers who conduct research on this theme including Abbas, et al. (2015) regarding efficiency, productivity, and Islamic banks. Specifically calculating the Malmquist Index of Islamic and conventional banks, which shows that the productivity of Islamic banks decreased in 2007 but increased in 2008 to 2009. Islamic banks had higher productivity growth from 2005 to 2006, but they experienced lower growth in the following years compared to conventional banks. However, in the research of Abbas, et al. (2015) The study was only limited to the years 2005 to 2009 in Pakistan. In addition, research conducted by Fauzi (2018) on the efficiency of Islamic people's financing banks (BPRS) in Central Java province shows that the source of inefficiency in BPRS in Central Java is the use of input variables that are less than optimal. Such as Third Party Funds (DPK). Operating expenses and fixed assets are excessive and less than optimal in use, making BPRS have inefficient performance. Therefore, in order for BPRS in Central Java to become efficient, it is necessary to maximise the existing input variables.

Based on this background, this study aims to analyse the efficiency and productivity of BPR and BPRS in two provinces, namely Central Java, and Yogyakarta during the four-year observation period (2017-2020). Furthermore, because the covid-19 pandemic emerged at the end of 2019 and began to spread massively in 2020, this study also aims to analyse whether the pandemic affects the efficiency of BPR and BPRS in the two provinces. This research will also provide an analysis of potential improvements to improve the efficiency of the banks concerned.

LITERATURE REVIEW

Rural Banks (BPR)

In Indonesia, the emergence of Rural Banks (BPR) officially began in 1989 through on Keputusan Presiden Nomor 38, UU No 7 Tahun 1992 and UU No 10 Tahun 1998. (Ahmed, 2004). The first BPR was established in 1989 followed by the emergence of BPRS two years later (Seibel, 2008). UU No.21 Tahun 2008 states that BPRS are conventional banks that do not provide services in payment traffic.

BPR as an intermediary institution has different characteristics from other commercial banks, these differences include: 1) BPRs cannot participate in payment traffic activities and are not allowed to accept deposits in the form of demand deposits; 2) Cannot conduct business activities in foreign currencies; 3) Not allowed to do capital participation; 4) Prohibited from doing insurance business; 5) And prohibited from doing other business outside the business activities as referred to in article 13 of Law No.7 of 1992 concerning banking, which was later amended into Law No. 23 Year 1999. The reason for BPR's success in providing services to the community is due to its strategic location closer to the market, faster processing, simple service procedures, and better personalised approach to customers (Suliyanto & Jati, 2014). Although BPRs have relatively small economies of scale, their ability to provide access to finance to the community is very important (Hartono, Djohar, & Heny, 2008).

Islamic Rural Banks (BPRS)

BPRS is a bank that conducts its business activities based on sharia principles and in its business activities does not provide services in payment traffic. The legal form can be in the form of Limited Liability Company (PT), and Cooperative or Regional Company. (Pasal 2 PBI No. 6/17/PBI/2004). As explained in Law Number 21 of 2008, BPRS is a sharia bank which in its business activities does not provide services in payment traffic.

Financial Services Authority Regulation (POJK) Number 3/POJK.03/2016 regarding BPRS, regulates BPRS to be divided into four zones. The zone division is based on the potential economic potential of the region as well as the level of competition of financial institutions in each region concerned. Zone one is classified as having high economic potential and intense competition among financial institutions, while zone four is classified as having lower economic potential and less competitive among financial institutions. The performance of BPRS located in big cities will certainly be different from BPRS located in small cities due to the ease of access to commercial banks in these areas. For example, BPRS located in Eastern Indonesia are expected to perform better than those in Greater Jakarta.

This is due to the fact that commercial banks in Eastern Indonesia are more difficult to access with lower competition than in big cities with higher competition.

Although BPRS is statistically inferior to BPR and conventional commercial banks, its role in the Indonesian economy is prominent as it tends to have both a social and commercial mission (Seibel dan Agung, 2006). In addition, BPRS can be a solution in filling the gap of financing sources for small and medium enterprises (SMEs) in accordance with sharia principles. BPRS has an important role in the progress of SMEs in Indonesia, and as it is known that SMEs have a high contribution in Indonesia (Masyita & Ahmed, 2013). BPRS has a special purpose of providing financing and assistance to low-income communities and Micro, Small and Medium Enterprises (MSMEs) as an effort to reduce poverty and realise community welfare.

The differences between BPR and BPRS are: 1) Akad and Legality; 2) There is a Sharia Supervisory Board (DPS); Dispute resolution through the Sharia Arbitration Board or Religious Court; 4) Prohibition of doing business haram, syubhat and that cause mudharat for other parties; 5) profit sharing system in the collection and distribution of financing.

Efficiency and Productivity

The concept of efficiency is often seen in terms of cost as input and profit as output. Business entities always endeavour to reduce costs to the minimum level possible to produce the maximum level of output in the form of profit. The concept of efficiency comes from the microeconomic concept of producer theory. Producer theory tries to maximise profits or minimise costs from the producer's point of view. In the producer theory, there is a production frontier curve that describes the relationship between inputs and outputs of the production process. This production frontier curve represents the maximum level of output from each input utilisation that represents the technology utilisation of a firm or industry. (Hersinta & Akbar, 2013). Productivity is a concept that measures the ratio of total output to a weighted average of inputs, two important variants are labour productivity, which calculates the amount of output per unit of labour, and total factor productivity which measures output per unit of total inputs, although increasing returns to scale are potentially large in many sectors, in some ha decreasing returns to scale occur (Samuelson, Paul, Nordhaus, & William, 2003).

Productivity is basically the relationship between output and input in a production, productivity can be measured partially or totally, partial productivity is the relationship between output and one input, an example of partial productivity that is often used is labour productivity which shows the average output per labour, or capital productivity which describes the average output per capital. Total Factor Productivity (TFP), measures the relationship between output and several inputs simultaneously, the relationship is expressed in the ratio of the output index to the aggregate input index, if the ratio increases it means more output can be produced using a certain amount of input or a certain amount of output can be produced using fewer inputs (Avenzora, 2008).

Efficiency and productivity are often used as a measuring tool to calculate the achievement of a financial institution. This is usually associated with financial institutions in achieving their objectives. Therefore, efficiency and productivity can be seen in terms of financing and operations as outputs and fixed assets, labour and customer deposits as inputs.

Efficiency can be known by calculating the ratio of output and input, while productivity is the relationship between output and input (Putra, Syifadhiya, Widyastiti, & Pambuko, 2018).

Previous Research

Research on banking efficiency, especially on BPR and BPRS, has been conducted by several previous researchers, including: Hosen & Warninda (2014) tries to analyse the efficiency and profitability matrix of Islamic Rural Banks (BPRS) in Indonesia, as well as to analyse the factors that influence the efficiency of Islamic Rural Banks (BPRS). Furthermore, Warninda & Hosen (2015) again analysed the efficiency and profitability of BPRS in Indonesia using the Variable Returns to Scale model on Data Envelopment Analysis (DEA) and the efficiency-profitability matrix.

Furthermore, Sadono (2017) measured technical efficiency and identified factors that influence the inefficiency of BPRS in East Java Province. Jatmiko (2017) examine whether ownership structure affects the technical efficiency of both Islamic and conventional BPRs in Indonesia. Devi & Firmansyah (2018) Investigating the direct and indirect effects of macroeconomic and microeconomic variables on financial distress using efficiency variables as mediators. Agustina, Sholihin, & Fithria (2019) To measure and analyze the technical efficiency of BPR Syariah Indonesia using panel data from Quartile I 2011 to Quartile IV 2016. Nugrohowati (2019) to measure the efficiency level of BPRS in Indonesia during the period 2012 to 2015 in accordance with regional zones. And Anwar, Nidar, Komara, & Layyinaturobbaniyah (2020) analyze the efficiency of BPRs in Indonesia, particularly in two provinces, West Java and Bali.

RESEARCH METHOD

Data

This study aims to analyze the efficiency and productivity of BPR and BPRS in Central Java and Yogyakarta with a total of 20 BPRs in Central Java, 20 BPRs in Yogyakarta, 20 BPRS in Central Java, and 12 BPRS in Yogyakarta during the four-year observation period 2017-2020. In examining efficiency and productivity, input and output variables are needed. This study uses input and output variables that refer to research conducted by (Hadad, 2003). The variables in this study can be seen in table 1 and 2, below :

Table 1. Variable Input Grouping

No.	Input	Explanation
1	Fixed Assets	Tangible assets used for production activities and the provision of goods and services, leased to third parties, or for administrative purposes, expected to be utilized for more than one accounting period.
2	Labor Costs	The cost of labor is the price charged for the use of human labor.
3	Third-party Funds	Funds collected by the bank from the general public, consisting of demand deposits, savings deposits, and time deposits.

Table 2. Variable Output Grouping

No.	Output	Explanation
1	Total Financing	The components of financing used include Murabahah financing, Mudharabah financing, and Musyarakah financing, while credits encompass all types of loans provided.
2	Operating Revenue	It comprises the total operational revenue generated by the respective bank.

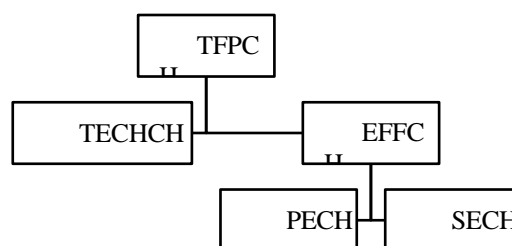
This study uses two approaches including to measure efficiency using MAX DEA software, while to measure the Malmquist productivity index using DEAP 2.1 software. The calculation of the efficiency and productivity of BPR and BPRS in Central Java and Yogyakarta was carried out using the BCC or VRS approach with an orientation on output.

Approach

Data Envelopment Analysis originally developed by [Charnes, Cooper & Rhodes \(1978\)](#) and later redeveloped by [Banker, Charnes, & Cooper \(1984\)](#) to measure the productivity and efficiency of business units. DEA is widely used to measure technical efficiency, including financial institutions ([Sharma, Sharma, & Barua, 2013](#)). The DEA method can provide information about Decision Making Units (Islamic Banks) that are not efficient in using input and output variables. This method also provides information on how much inputs and outputs must be adjusted in order to achieve efficiency. There are two basic models in the analysis using DEA including the Charnes model, Chopper & Rhodes (CCR) dan Model Bankir, Charnes & Rhodes (BCR). This research uses the BCC/BCR model, where the BCR model assumes that the change in output value produced by DMU is different for each proportion of changes in the value of certain inputs. This is in line with Variable Return to Scale (VRS), which means that each input does not necessarily produce the same output.

Malmquist Productivity Index

Malmquist Productivity Index (MPI) DEA was originally introduced by Caves, Christensen, and Diewert (CCD) in 1982 and empirically applied by [Färe, Grosskopf, Lindgren, and Roos \(1992\)](#) and [Färe, Grosskopf, Norris, and Zhang \(1994\)](#). In this study, the productivity change of Islamic banks is measured using MPI with output orientation. Furthermore, Total Factor Productivity Change (TFPCH) will be determined into Technological Change (TECHCH) and Efficiency Change (EFFCH). Changes in EFFCH are associated with Pure Technical Efficiency Change (PTECH), and Scale Efficiency Change (SECH). The interaction between efficiency indices is shown in figure 1:

**Figure 1. Index Productivity**

The efficiency change index can be further decomposed into a mutually comprehensive PECH (Pure Efficiency Changes) component, calculated relative to VRS technology and a SECH (Scale Changes) component, capturing deviations between VRS and CRS technologies as suggested by Färe. Productivity change factors can be seen through the Efficiency Change Index (EFFCH) and Technology Change Index (TECHCH) values to explain productivity changes. Meanwhile, Pure Efficiency Change Index (PECH) and Scale Efficiency Change Index (SECH) are used to determine the causes of changes in the efficiency change index (EFFCH). The Total Factor Productivity (TFP) value indicates the change in the index. If the value of $M > 1$ indicates an increase in productivity, $M = 1$ indicates no increase in productivity, and $M < 1$ indicates a decrease in productivity of Islamic banking.

RESULTS AND DISCUSSIONS

Table 3 and 4 provides information on the input and output variables used in the study to measure the efficiency of BPR and BPRS in Central Java and Yogyakarta during the four-year observation period, namely 2017-2021.

Table 3. Input and Output Variable Information for Rural Banks (BPR)

BPR Central Java			
Input Variable	Mean	Max	Min
Fixed Assets	Rp 7.417.913	Rp 22.771.385	Rp 1.310.105
Labor Costs	Rp 55.996.804	Rp 319.429.750	Rp 13.930.472
Third-party Funds	Rp 463.917.211	Rp 1.919.020.722	Rp 181.317.989
Output Variable	Mean	Max	Min
Total Financing Granted	Rp 458.822.018	Rp 2.345.298.562	Rp 153.004.496
Operating Revenue	Rp 76.582.791	Rp 426.473.154	Rp 23.744.333

BPR Yogyakarta			
Input Variable	Mean	Max	Min
Fixed Assets	Rp 7.798.939	Rp 43.302.104	Rp 57.519
Labor Costs	Rp 18.987.423	Rp 89.800.034	Rp 1.055.700
Third-party Funds	Rp 179.288.102	Rp 645.048.559	Rp 5.334.235
Output Variable	Mean	Max	Min
Total Financing Granted	Rp 25.124.051	Rp 96.529.366	Rp 1.075.893
Operating Revenue	Rp 173.103.468	Rp 792.975.445	Rp 4.444.411

Table 4. Input and Output Variable Information for Sharia Rural Banks (BPRS)

BPRS Central Java					
Input Variable	Input Variable		Max		Min
Fixed Assets	Rp	1.568.017	Rp	9.672.288	Rp 37.368
Labor Costs	Rp	4.521.498	Rp	27.297.995	Rp 1.487.283
Third-party Funds	Rp	42.110.821	Rp	153.519.910	Rp 8.103.740
Output Variable	Output Variable		Max		Min
Total Financing Granted	Rp	8.735.869	Rp	48.109.519	Rp 550
Operating Revenue	Rp	7.400.914	Rp	31.394.874	Rp 325.434

BPRS Yogyakarta					
Input Variable	Mean		Max		Min
Fixed Assets	Rp	2.046.645	Rp	17.654.981	Rp 278.921
Labor Costs	Rp	3.953.950	Rp	7.578.517	Rp 727.594
Third-party Funds	Rp	48.214.284	Rp	127.761.542	Rp 6.187.301
Output Variable	Mean		Max		Min
Total Financing Granted	Rp	10.728.025	Rp	56.971.393	Rp 403
Operating Revenue	Rp	5.721.858	Rp	14.507.137	Rp 1.096.568

Efficiency Score of BPR and BPRS in Central Java and Yogyakarta

Tables 5 and 6 below show the efficiency value with the Variable Return to Scale (VRS) approach of BPR and BPRS in Central Java and Yogyakarta. From the data, it can be seen that the efficiency of BPR and BPRS in Central Java and Yogyakarta fluctuates every year. When viewed from the average value of efficiency per year from BPR and BPRS, there are still many banks that have not reached maximum efficiency (1.000), and there are also some banks that have low efficiency.

Table 5. Efficiency Scores of Rural Banks (BPR) in Central Java and Yogyakarta

BPR Central Java					BPR Yogyakarta				
Name	2017	2018	2019	2020	Name	2017	2018	2019	2020
BPR bank bapas magelang	0,985	0,877	0,900	0,851	BPR Alto Makmur BPR	1,000	1,000	0,921	1,000
BPR bank boyolali	0,944	0,954	0,905	0,881	Ambarketawang Persada	1,000	1,000	0,968	0,927
BPR Bank daerah karanganyar	0,932	0,924	1,000	0,796	BPR Arta Agung	0,942	0,994	0,825	0,830
BPR Bank daerah pati	1,000	0,966	0,928	0,887	BPR Artha Mlatiindah	1,000	1,000	1,000	0,996
BPR Bank jepara artha jepara	0,968	0,943	0,926	0,874	BPR Artha Parama	0,903	0,922	0,864	0,723
BPR Bank klaten	1,000	0,995	0,999	1,000	BPR Bank Bantul (Perseroda)	0,959	0,992	1,000	1,000
BPR Bank wonosobo	1,000	0,862	0,828	0,774	BPR Bank Sleman (Perseroda)	1,000	1,000	1,000	0,905
BPR BKK jepara	0,897	0,919	0,892	0,869	BPR Bhakti Daya Ekonomi	0,805	0,767	0,894	0,955
BPR Bkk karangmalang sragen	0,872	0,825	0,845	0,838	BPR Chandra Muktiartha	1,000	0,981	1,000	1,000

BPR Central Java					BPR Yogyakarta				
BPR BKK kebumen	0,838	0,858	0,860	0,847	BPR Danagung Abadi	0,703	0,741	0,793	0,748
BPR BKK Kendal	0,899	0,877	0,875	0,863	BPR Danagung Bakti	0,785	0,681	0,810	0,779
BPR BKK purwodadi	0,867	0,904	0,884	0,905	BPR Danagung Ramulti	0,783	0,760	0,863	0,827
BPR BKK grobogan					BPR Karangwaru Pratama	0,857	0,970	1,000	0,968
BPR BKK purwokerto	0,893	0,835	0,859	0,838	BPR Kurnia Sewon	0,830	0,825	0,850	0,838
BPR BKK banyumas					BPR Nusantara Artha Makmur	1,000	1,000	0,967	0,884
BPR BKK Wonogiri	0,817	0,843	0,848	0,791	BPR Panca Arta Monjali	0,880	0,898	0,945	0,949
BPR BP kabupaten temanggung	1,000	0,859	0,841	0,811	BPR Profidana Paramitra	0,900	0,901	0,908	0,846
BPR gunung slamet cilacap	1,000	1,000	1,000	1,000	BPR Sejahtera Arthatama Mandiri	0,889	1,000	1,000	1,000
BPR Rejeki insani kota surakarta	0,841	0,859	0,825	0,817	BPR Shinta Daya	0,905	0,901	0,975	0,922
BPR Surya yudhakencana banjarnegara	0,997	1,000	1,000	1,000	Perumda BPR Bank Jogja	0,957	1,000	1,000	1,000
BPR Suryayudha wonosobo	0,997	1,000	1,000	1,000					
BPR Weleri makmur kota semarang	0,877	1,000	0,970	0,905					
Mean	0,931	0,915	0,909	0,877	Mean	0,905	0,917	0,929	0,905

Table 6. Efficiency Scores of Sharia Rural Banks (BPRS) in Central Java and Yogyakarta

BPRS Central Java					BPRS Yogyakarta				
Name	2017	2018	2019	2020	Name	2017	2018	2019	2020
PT BPRS Arta Leksana banyumas	0,715	0,707	0,691	0,719	BPRS Bangun Drajat Warga	1,000	0,953	1,000	1,000
PT BPRS Artha Amanah Ummat semarang	0,893	0,847	0,798	0,761	BPRS Barokah Dana Sejahtera	0,927	1,000	0,988	1,000
PT BPRS Artha Mas Abadi pati	0,838	0,744	0,828	0,805	BPRS Cahaya Hidup	1,000	1,000	0,775	1,000
PT BPRS Artha Surya Barokah semarang	1,000	0,676	0,839	1,000	BPRS Dana Hidayatullah	1,000	1,000	1,000	1,000
PT BPRS Asad Alif Kendal	0,783	0,744	0,768	0,744	BPRS Danagung Syariah	0,661	0,726	0,359	0,269
PT BPRS Bina Amanah Satria banyumas	0,742	0,728	0,772	0,730	BPRS FORMES	0,822	0,790	1,000	0,627
PT BPRS Bina Finansia kota semarang	0,776	0,780	0,688	0,589	BPRS Madina Mandiri Sejahtera	1,000	0,816	0,750	0,670
PT BPRS Buana Mitra Perwira purbalingga	0,744	0,804	0,916	1,000	BPRS Margirizki Bahagia	0,952	1,000	0,797	0,559

BPRS Central Java					BPRS Yogyakarta				
PT BPRS Bumi Artha Sampang cilacap	0,744	0,768	0,763	0,723	BPRS Mitra Amal Mulia	0,654	0,589	0,596	0,640
PT BPRS Central Syariah Utama surakarta	0,826	0,817	0,896	0,339	BPRS Mitra Cahaya Indonesia	1,000	0,906	1,000	0,681
PT BPRS Dana Amanah Surakarta	1,000	0,976	1,000	0,983	BPRS Mitra Harmoni Yogyakarta	1,000	1,000	0,836	0,590
PT BPRS Dharma Kuwera klaten	0,666	0,768	0,950	0,662	BPRS Unisia Insan Indonesia	0,918	1,000	0,794	0,948
PT BPRS Gala Mitra Abadi grobogan	1,000	0,764	0,846	1,000					
PT BPRS Insan Madani	0,863	1,000	0,911	0,810					
PT BPRS Khasanah Ummat banyumas	1,000	0,881	1,000	1,000					
PT BPRS Mitra Harmoni Kota Semarang	1,000	0,971	0,936	0,889					
PT BPRS Saka Dana Mulia	1,000	0,695	0,794	1,000					
PT BPRS Sukowati Sragen	1,000	0,112	1,000	1,000					
PT BPRS Al Mabrur Klaten	0,970	1,000	1,000	1,000					
PT BPRS Suriyah cilacap	0,925	0,869	0,802	0,852					
Mean	0,874	0,783	0,860	0,830	Mean	0,911	0,898	0,825	0,749

In addition to analyzing the efficiency scores of BPR and BPRS in Central Java and Yogyakarta per year, this study also provides information on the average efficiency of each bank. Tables 7 and 8 below show the average efficiency scores of BPRs and BPRSs in Central Java and Yogyakarta. Based on the analysis, it can be seen that there is only one bank in Central Java that has achieved maximum efficiency (1.000), namely BPR Gunung Slamet Cilacap. Furthermore, there are also BPRs in Central Java that have almost reached maximum efficiency, as for BPRs with the order of the other three largest are BPR Surya yudhakencana banjarnegara, BPR Suryayudha wonosobo, and BPR Bank klaten. Furthermore, for BPRs in Yogyakarta, there is no bank that has reached maximum efficiency (1.000). However, there are banks that almost reach maximum efficiency, while the banks that rank in the top three are BPR Artha Mlatiindah, BPR Chandra Muktiartha, and Perumda BPR Bank Jogja.

Table 7. Average Efficiency Scores of Rural Banks (BPR) in Central Java and Yogyakarta

BPR Central Java	Mean	BPR Yogyakarta	Mean
BPR bank bapas magelang	0,903	BPR Alto Makmur	0,980
BPR bank boyolali	0,921	BPR Ambarketawang Persada	0,974
BPR Bank daerah karanganyar	0,913	BPR Arta Agung	0,898
BPR Bank daerah pati	0,945	BPR Artha Mlatiindah	0,999
BPR Bank jepara artha jepara	0,928	BPR Artha Parama	0,853
BPR Bank klaten	0,999	BPR Bank Bantul (Perseroda)	0,988
BPR Bank wonosobo	0,866	BPR Bank Sleman (Perseroda)	0,976
BPR BKK jepara	0,894	BPR Bhakti Daya Ekonomi	0,855
BPR Bkk karangmalang sragen	0,845	BPR Chandra Muktiartha	0,995
BPR BKK kebumen	0,851	BPR Danagung Abadi	0,746
BPR BKK Kendal	0,878	BPR Danagung Bakti	0,764
BPR BKK purwokerto banyumas	0,856	BPR Karangwaru Pratama	0,949
BPR BKK Wonogiri	0,825	BPR Kurnia Sewon	0,836
BPR BP kabupaten temanggung	0,878	BPR Nusantara Artha Makmur	0,963
BPR gunung slamet cilacap	1,000	BPR Panca Arta Monjali	0,918
BPR Rejeki insani kota surakarta solo	0,836	BPR Profidana Paramitra	0,889
BPR Surya yudhakencana banjarnegara	0,999	BPR Sejahtera Arthatama Mandiri	0,972
BPR Suryayudha wonosobo	0,999	BPR Shinta Daya	0,926
BPR Weleri makmur kota semarang	0,938	Perumda BPR Bank Jogja	0,989

Then, based on the analysis conducted on BPRS in Central Java, there is no bank that reaches maximum efficiency (1,000). Although there is no maximum efficiency, there are a number of banks whose efficiency value is close to the maximum, as for the banks whose efficiency value ranks in the top three, including PT BPRS Dana Amanah Surakarta, PT BPRS Al Mabrur Klaten, and PT BPRS Khasanah Ummat banyumas. Meanwhile, for BPRS in Yogyakarta, only one bank managed to achieve maximum efficiency, namely BPRS Dana Hidayatullah. Furthermore, there are also other BPRS in Yogyakarta that almost achieve maximum efficiency, as for the three banks that top the list are BPRS Bangun Drajat Warga, BPRS Barokah Dana Sejahtera, and BPRS Cahaya Hidup.

Table 8. Average Efficiency Scores of Sharia Rural Banks (BPRS) in Central Java and Yogyakarta

BPRS Central Java	Mean	BPRS Yogyakarta	Mean
PT BPRS Al Mabrur Klaten	0,993	BPRS Bangun Drajat Warga	0,988
PT BPRS Arta Leksana banyumas	0,708	BPRS Barokah Dana Sejahtera	0,979
PT BPRS Artha Amanah Ummat semarang	0,804	BPRS Cahaya Hidup	0,944
PT BPRS Artha Mas Abadi pati	0,879	BPRS Dana Hidayatullah	1,000
PT BPRS Artha Surya Barokah Semarang	0,760	BPRS Danagung Syariah	0,504
PT BPRS Asad Alif Kendal	0,743	BPRS FORMES	0,810
PT BPRS Bina Amanah Satria Banyumas	0,708	BPRS Madina Mandiri Sejahtera	0,809
PT BPRS Bina Finansia kota semarang	0,866	BPRS Margirizki Bahagia	0,827
PT BPRS Buana Mitra Perwira Purbalingga	0,749	BPRS Mitra Amal Mulia	0,619
PT BPRS Bumi Artha Sampang cilacap	0,720	BPRS Mitra Cahaya Indonesia	0,897
PT BPRS Central Syariah Utama Surakarta	0,990	BPRS Mitra Harmoni Yogyakarta	0,857
PT BPRS Dana Amanah Surakarta	0,761	BPRS Unisia Insan Indonesia	0,915

Comparison of Efficiency Trends of BPRs in Central Java and Yogyakarta

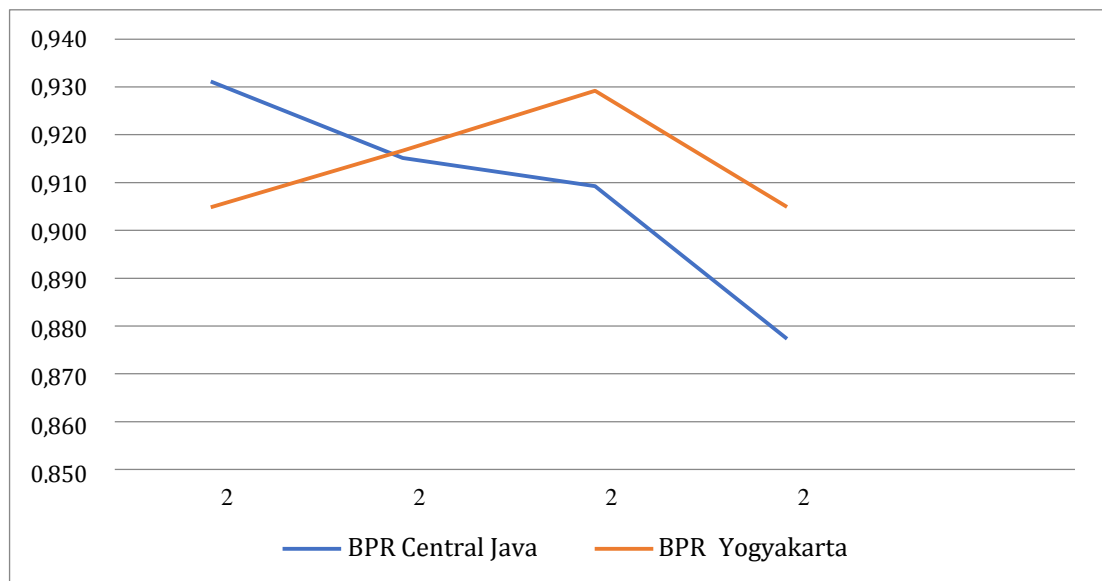


Figure 2. Comparison of Efficiency Trends in Rural Banks in Central Java and Yogyakarta

Based on the efficiency trend graph above, it can be seen that BPR Yogyakarta has a higher efficiency value than BPR Central Java. In 2018 the efficiency value of BPR in Yogyakarta increased from 0.905 to 0.917, while BPR in Central Java experienced a decrease in efficiency from 0.931 to 0.915. Furthermore, in 2019, BPRs in Yogyakarta experienced an increase in efficiency again to 0.929, while BPRs in Central Java experienced a decrease to 0.909. Then at the end of the research period, namely in 2020, BPRs in Yogyakarta and Central Java both experienced a decrease in efficiency to 0.905 and 0.887.

Comparison of Efficiency Trends of BPRS in Central Java and Yogyakarta

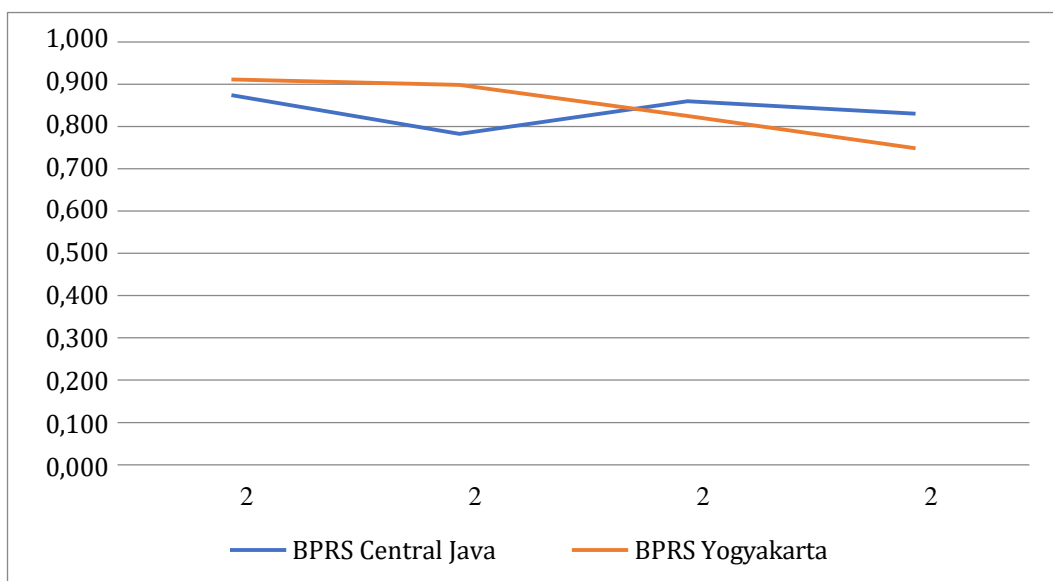


Figure 3. Comparison of Efficiency Trends in Sharia Rural Banks in Central Java and Yogyakarta

Other analysis results can be seen from the efficiency trend graph of BPRS in Central Java and Yogyakarta. When compared between the two BPRS in Central Java and Yogyakarta,

the efficiency score of BPRS in Yogyakarta is higher than that of BPRS in Central Java. However, BPRS in Yogyakarta experienced a consecutive decline in efficiency during the observation period. In 2018, the efficiency score of BPRS in Central Java decreased from 0.874 to 0.783, the same thing also happened to BPRS in Yogyakarta which experienced a decrease in efficiency from 0.911 to 0.898. Furthermore, in 2019, efficiency in Central Java increased to 0.860, while efficiency in Yogyakarta decreased again to 0.825. Then in 2020, BPRS in Central Java and Yogyakarta both experienced a decrease in efficiency to 0.830 and 0.749 respectively.

Impact of Covid-19 on BPR and BPRS in Central Java and Yogyakarta

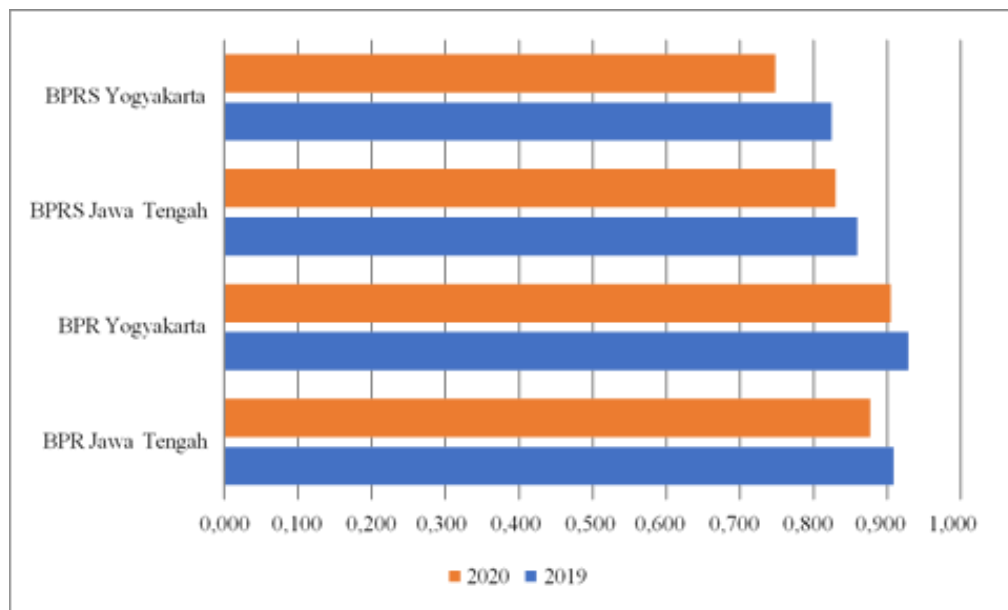


Figure 4. Efficiency BPR and BPRS in Central Java and Yogyakarta

The figure above shows the efficiency graph of BPR and BPRS in Central Java and Yogyakarta during the Covid 19 pandemic which began at the end of 2019 to 2020. From the results of the graph, it is known that all BPRs and BPRS in Central Java and Yogyakarta showed a decrease in efficiency. In 2019, the efficiency score at BPR in Central Java was 0.909, BPR Yogyakarta was 0.929, BPRS in Central Java was 0.860, and BPRS in Yogyakarta was 0.825. Then in the following year all banks experienced a decrease in efficiency to 0.877 for BPR in Central Java, 0.905 for BPR in Yogyakarta, 0.830 for BPRS in Central Java, and 0.749 for BPRS in Yogyakarta. From these results, it can be concluded that the covid 19 pandemic affects the efficiency of BPR and BPRS in Central Java and Yogyakarta.

Potential Improvement

Besides being able to produce efficiency values, the DEA method can also provide information about potential improvements or the level of improvement needed to achieve optimal efficiency values. Through potential improvement analysis, the variables that need to be optimized can be known. The potential improvement analysis is calculated by using the last year of observation, and the measurement is done separately from the previous years to

illustrate the value that must be achieved. The results of the potential improvement measurement can be seen in the graph below:

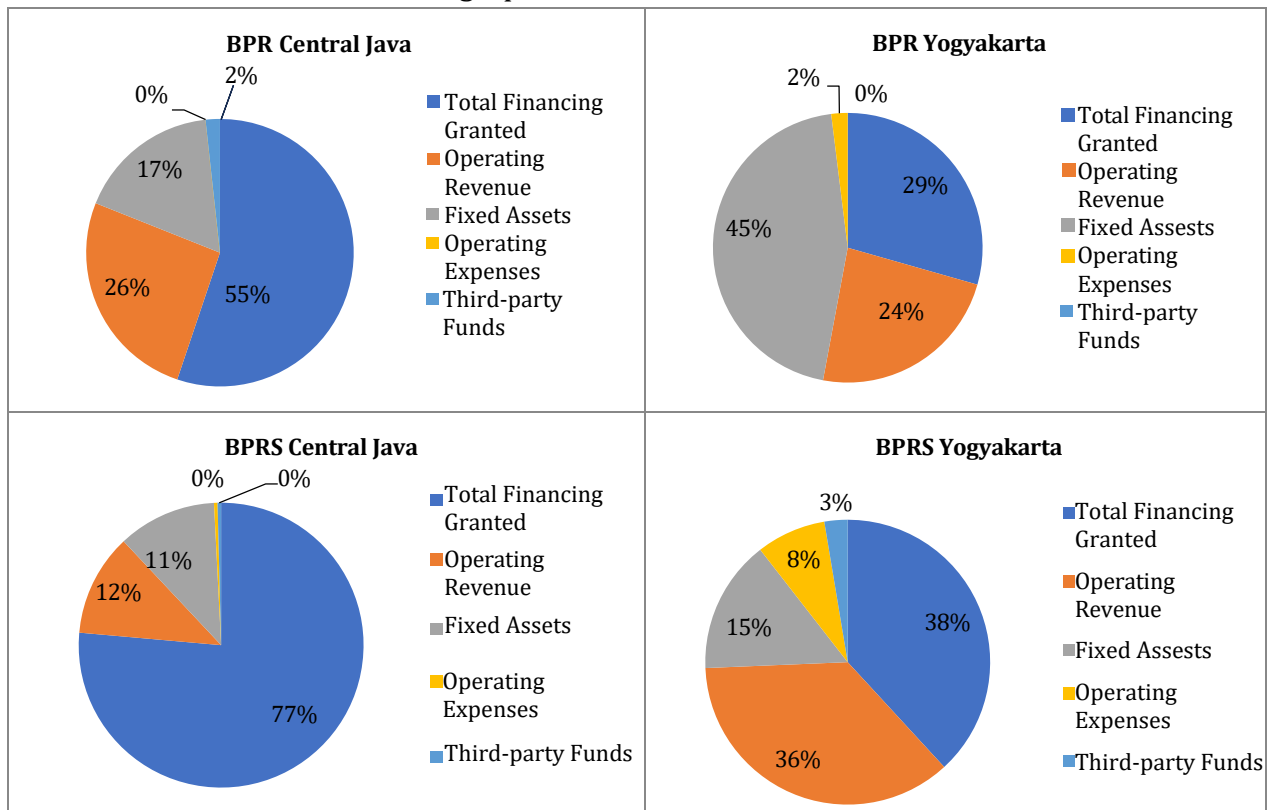


Figure 5. Potential Improvement BPR dan BPRS Jawa Tengah dan Yogyakarta

To find out the source of inefficiency of BPR and BPRS in Central Java and Yogyakarta can be seen through potential improvement. The pie chart above provides an overview related to input and output variables at BPR and BPRS in Central Java and Yogyakarta that are inefficient.

In BPRs in Central Java, the variable that causes the greatest inefficiency comes from the output variable, namely the amount of financing provided. In order to achieve maximum efficiency, BPRs in Central Java should increase the output variable, namely the amount of financing provided by 55% and operating income by 26%. As for the input variable, fixed assets need to be reduced by 17%. Furthermore, for BPRs in Yogyakarta, the variable that causes the greatest inefficiency is the input variable, namely fixed assets. In order to achieve maximum efficiency, the BPR in Yogyakarta should reduce the input variable of fixed assets by 45%. Meanwhile, it needs to increase the output variable which consists of financing provided to 29% and operating income to 24%.

In BPRS in Central Java, the variable that causes the greatest inefficiency is the amount of financing provided. In order to achieve maximum efficiency, the BPRS in Central Java needs to increase the output variable, namely the amount of financing provided by 77% and operating income by 12%. While the input variable, namely fixed assets, needs to be reduced by 11%. Furthermore, for BPRS in Yogyakarta, the biggest cause of inefficiency comes from the output variables, namely financing provided and operating income. In order to achieve maximum efficiency, the BPRS in Yogyakarta must increase the output variable consisting of the amount of financing provided by 38% and operating income by 36%.

Productivity Analysis of BPR and BPRS in Central Java and Yogyakarta Table 9 below illustrates the results of the estimated value of the Malmquist Productivity Index (MPI) of BPR and BPRS in Central Java. The MPI results used in this study can be seen in Total Factor Productivity Changes (TFPCH) which is influenced by Efficiency Changes (EFFCH) and Technological Changes (TECHCH).

Table 9. Malmquist Index Scores for Rural Banks in Central Java and Yogyakarta per Year

BPR Central Java					
Period	Effch	Techch	Pech	Sech	Tfpch
2017-2018	1.021	0.808	1.036	0.985	0.825
2018-2019	1.004	1.048	0.994	1.011	1.052
2019-2020	1.025	0.865	1.010	1.015	0.887
Average	1.017	0.901	1.013	1.004	0.916

BPR Yogyakarta					
Period	Effch	Techch	Pech	Sech	Tfpch
2017-2018	0.918	1.255	0.994	0.923	1.152
2018-2019	0.987	0.737	0.964	1.023	0.727
2019-2020	1.074	1.591	1.053	1.021	1.709
Average	0.991	1.137	1.003	0.988	1.127

The table above shows the Malmquist Index score per year of BPRs in Central Java and Yogyakarta. When viewed from the average TFPCH score, BPRs in Central Java experienced a decrease in productivity with the TECHCH value decreasing, while the EFFCH value increased. Then when viewed from the TFPCH value in the previous year, in the 2017-2018 period, the TFPCH value of BPR in Central Java experienced a decrease in productivity with TECHCH decreasing, while the EFFCH value increased. Furthermore, in the 2018-2019 period, the TFPCH value experienced an increase in productivity with the TECHCH value increasing and the EFFCH value stagnating. Then in the 2019-2020 period, the TFPCH value experienced a decrease in productivity again with the TECHCH value decreasing, while the EFFCH value increased. From these results, it can be concluded that the main factor affecting the productivity of BPRs in Central Java is due to technological factors.

The results of further analysis can be seen in the average TFPCH score of BPRs in Yogyakarta which shows an increase in productivity. Although the average value of EFFCH has decreased, the value of TCHCH has increased. Then when viewed from the previous year's analysis, it is known that in the 2017-2018 period, the TFPCH value of BPR in Yogyakarta has increased with the TCHCH value also increasing and the EFFCH value decreasing. Furthermore, in the 2018-2019 period, the TFPCH value decreased dramatically with the TCHCH and EFFCH values both also decreasing. And in 2019-2020, the TFPCH value increased again with the TCHCH and EFFCH values both increasing. From these results, it can be concluded that the main factor affecting the productivity of BPRs in Yogyakarta is caused by technological factors.

Table 10. Malmquist Index Scores for Sharia Rural Banks in Central Java and Yogyakarta per Year

BPRS Central Java					
Period	Effch	Techch	Pech	Sech	Tfpch
2017-2018	1.150	0.736	1.031	1.116	0.846
2018-2019	0.823	1.271	0.840	0.980	1.046
2019-2020	1.169	1.151	1.170	0.999	1.345
Average	1.034	1.025	1.004	1.030	1.060

BPRS Yogyakarta					
Period	Effch	Techch	Pech	Sech	Tfpch
2017-2018	0.906	0.604	0.949	0.955	0.548
2018-2019	0.945	1.697	1.010	0.935	1.603
2019-2020	1.121	0.953	0.991	1.131	1.068
Average	0.986	0.992	0.983	1.003	0.979

The table above shows the Malmquist Index score per year of BPRS in Central Java and Yogyakarta. When viewed from the average TFPCH score, BPRS in Central Java experienced an increase in productivity with TECHCH and EFFCH values both increasing. Then when viewed from the TFPCH value in the previous year, in the 2017-2018 period the TFPCH value of BPRS in Central Java experienced a decrease in productivity with TECHCH decreasing, while the EFFCH value increased. Furthermore, in the 2018-2019 period, the TFPCH value experienced an increase in productivity with the TECHCH value increasing, while the EFFCH value decreased. Then in the 2019-2020 period, the TFPCH value again experienced an increase in productivity with the TECHCH and EFFCH values both increasing. From these results, it can be concluded that the main factor affecting the productivity of BPRS in Central Java is due to technological factors.

The results of further analysis can be seen in the average TFPCH score of BPRS in Yogyakarta which shows an increase in productivity. When viewed from the average score of TFPCH, BPRS in Yogyakarta experienced a decrease in productivity with the value of TECHCH and EFFCH both also decreased. Then when viewed from the previous year's analysis, it is known that in the 2017-2018 period the TFPCH value of BPRS in Yogyakarta experienced a drastic decrease in productivity with the TECHCH value also experiencing a drastic decrease and the EFFCH value decreased. Furthermore, in the 2018-2019 period, the TFPCH value increased with the TCHCH value increasing, while EFFCH decreased. And in 2019-2020, the TFPCH value has increased but not as much as the previous year with the TCHCH value decreasing, while EFFCH has increased. From these results it can be concluded that the main factor affecting the productivity of BPRS in Yogyakarta is caused by technological factors.

Discussion of Analysis Results

There are several findings from the analysis of this research that are expected to provide information and can be a reference in decision making for the parties concerned. The first finding of this study can be seen from the efficiency table and the average efficiency score for each BPR and BPRS. The results show that there are still many BPRs and BPRS, especially in Central Java and Yogyakarta, which have not achieved maximum efficiency. And

there are also a number of BPRs and BPRS which are the object of research in the two provinces obtaining low efficiency.

There are various factors that cause the inefficiency of the banking industry, especially Islamic Commercial Banks in Indonesia, including the inability of banks to balance the use of variable inputs and outputs. An institution can be said to be efficient if it can use its inputs to produce maximum output without wasting resources (Naufal & Firdaus, 2018). In line with Prativi, Dewi & Lubis (2020) who state that an institution is said to be efficient if it can produce maximum output against a certain level of input, or can minimize costs (inputs) to achieve a certain level of output. The causes of the inefficiency of the two types of banks will be explained in the potential improvement analysis.

The second finding of this study can be seen from the efficiency trend graph comparison between BPR and BPRS in Central Java and Yogyakarta. In the comparative analysis of BPRs in Central Java and Yogyakarta, it can be seen that BPRs in Yogyakarta have higher efficiency than BPRs in Central Java. The main cause of inefficiency of BPR and BPRS in Central Java and Yogyakarta is located in the amount of financing. When compared, BPRS in Central Java have a large imbalance in the variable amount of financing against other variables compared to BPRs in Yogyakarta. This is what makes BPRs in Yogyakarta have a higher efficiency score than BPRs in Central Java.

Meanwhile, based on the comparative analysis of the efficiency of BPRS in Central Java and Yogyakarta, it can be seen that BPRS in Yogyakarta has a fairly higher efficiency compared to BPRS in Central Java. The main cause of inefficiency of BPRS in Central Java and Yogyakarta is located in the amount of financing provided. When compared, BPRS in Central Java also has a large imbalance in the variable amount of financing against other variables compared to BPRS in Yogyakarta. This is what makes BPRS in Yogyakarta have a higher efficiency score than BPRS in Central Java. Despite having a higher average efficiency, based on the observation of the last three years, BPRS in Yogyakarta continued to experience a decline in efficiency, while BPRS in Central Java had experienced an increase in efficiency and then experienced a decline again in the last two years.

The third finding of this study can be seen from the impact of Covid-19 on BPR and BPRS in Central Java and Yogyakarta. Based on the results of the analysis for two years of observation, namely 2019 and 2020, it is known that BPR and BPRS in Central Java and Yogyakarta experienced a decrease in efficiency. As research conducted by Ningsih and Mahfuz (2020) shows since the Covid-19 pandemic entered Indonesia, all banks in Indonesia have experienced a decline in collection and financing, this decline certainly affects the efficiency of the bank concerned. In the case of the Covid-19 pandemic, the average efficiency level of the banking industry in Indonesia has decreased due to a decrease in revenue and financing distribution, while banking operating costs continue to increase to meet the daily needs of banking operations. Therefore, it is very necessary to make efforts to improve the banking sector in order to achieve an optimal level of efficiency.

Furthermore, based on productivity analysis during the Covid 19 pandemic, BPR in Yogyakarta, BPRS in Central Java, and BPRS in Yogyakarta experienced an increase in productivity, while BPR in Central Java experienced a decrease in productivity. The cause of the increase in productivity of the bank is due to an increase in the use of technology. During the Covid-19 pandemic, there will be more changes in the ecosystem and expectations for

digital services. Thus, this makes banks have to change their business strategies, reorganize their distribution networks, and encourage banking strategies through digital channels (mobile app and internet). Including the use of the latest electronic banking tools in an effort to improve customer service (end-to-end digital solution) (Al-Muharrami, 2007; Barneveld et al., 2020; Otoritas Jasa Keuangan, 2020).

The fourth finding of this study can be seen from the analysis of potential improvement of BPR and BPRS in Central Java and Yogyakarta. Based on the analysis, the biggest cause of bank inefficiency is due to output variables, namely financing and operating income. Efficiency in financing can be measured by two aspects of assessment, first is the bank's ability to produce output which in this case is financing at low cost, and this aspect has a close relationship with the financing ratio and the development of bank assets. The second aspect is the bank's performance in minimizing risk in financing, or the bank's ability to distribute financing and minimize risk. (Iskandar, 2012).

Increasing efficiency and effectiveness in financing products will encourage asset growth and bank profitability. In addition, it will also increase the role of banks in managing customer funds so that their allocation can be more effective and efficient for the common good. (Hibatullah & Nurcahyani, 2021). Apart from the low amount of financing, another cause of inefficiency is due to the fixed assets owned by the bank. In principle, the large number of fixed assets owned will cause the high amount of depreciation expense of the bank concerned. Thus the depreciation expense will cause the operating expenses to be high so that the bank will experience inefficiency. Therefore, banks need to reduce unproductive fixed assets.

The last finding of this study can be seen from the Malmquist Productivity Index score of BPR and BPRS in Central Java and Yogyakarta. As it is known that bank productivity is influenced by efficiency changes and technological changes. From the results of the analysis conducted on BPR and BPRS in Central Java and Yogyakarta, it shows that the main factor affecting bank productivity is caused by changes in technology. Thus, digital transformation in the banking industry is very necessary and is one of the strategies to be more competitive. (Bahrini, 2015; Rani et al., 2020). Digital technology is needed by banks to assist in the process of completing all work, changing the way banks interact with customers, and creating new sources of revenue. (Norafni et al., 2020).

CONCLUSION AND RECOMMENDATION

Conclusion This study aims to analyze the efficiency and productivity of BPR and BPRS in Central Java and Yogyakarta with a total of 20 BPR in Central Java, 20 BPR in Yogyakarta, 20 BPRS in Central Java, and 12 BPRS in Yogyakarta during the four-year observation period (2017-2020). This study uses the BCC or VRS model as the basic model in analyzing bank efficiency and productivity using Data Envelopment Analysis and Malmquist Productivity Index.

The results obtained from the analysis of efficiency using DEA show that there are still many BPRs and BPRS in Central Java and Yogyakarta that have not achieved maximum efficiency, and there are even BPRs and BPRS in both provinces that have low efficiency. When compared between the two provinces, based on the results of the analysis, it is known that BPR in Yogyakarta has higher efficiency than BPR in Central Java. Likewise, BPRS in

Yogyakarta has high efficiency compared to BPRS in Central Java. However, BPRS in Yogyakarta in the last three years of the study period experienced a decline in efficiency.

Furthermore, based on the results of the analysis of the efficiency of BPR and BPRS in Central Java and Yogyakarta during the Covid-19 pandemic in the last two years of the research period (2019-2020), it shows a decrease in efficiency. The decline in efficiency was due to a decrease in revenue and distribution of financing, while banking operating costs continued to increase to meet the daily needs of banking operations.

Then based on the results of the analysis of potential improvement of BPR and BPRS in Central Java and Yogyakarta, it is known that the variable that causes bank inefficiency is the output variable, namely the amount of financing provided. In addition, the cause of inefficiency is also caused by the input variable, namely total fixed assets. Finally, this study also revealed the results of the Malmquist index score of BPR and BPRS in Central Java and Yogyakarta, basically the change in productivity is influenced by the level of efficiency change and technological change. This study found that the dominant factor causing the productivity of a number of Islamic Commercial Banks in Indonesia is influenced by technological change factors.

There are several suggestions from the research results for a number of parties, both practitioners, academics, and regulators. For banking practitioners, especially BPR and BPRS in Central Java and Yogyakarta provinces, it is expected to maximize the amount of financing to the community by offering financing products that are more competitive than conventional products. In addition, marketing techniques must be more innovative so that they can be absorbed by various groups of people. Further suggestions for banking practitioners, they must improve the quality of innovation and the use of technology and create digital banking products for customers. Then, suggestions for academics to be able to update information about banking efficiency and productivity by upgrading the research period and expanding the research object. By conducting further research by academics, it is hoped that they can find ways to improve banking efficiency and productivity. Finally, suggestions for regulators, namely the need for regulatory support for technology and digitalization for Islamic banking to improve its quality and productivity.

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